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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 19
OCTOBER 1, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 19
OCTOBER 1, 1978

W78-08801 -- W78-09300

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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07 RESOURCES DATA
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

REDOX PROCESSES AT SURFACES OF MANGANESE OXIDE AND THEIR EFFECTS ON AQUEOUS METAL IONS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-08851

2. WATER CYCLE

2A. General

METHOD FOR EVALUATING THE POSSIBLE CHANGES OF THE HYDROLOGIC CYCLE IN THE LANDSCAPES OF THE EXCESSIVELY WET ZONE AFTER A MODIFICATION OF THE ENVIRONMENT,
K. Ye. Ivanov, and O. G. Sorochan.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 326-333, 1976. 2 fig, 1 tab, 14 ref. Translated from Vestnik Leningradskogo Universiteta, No. 12, p 61-74, 1976.

Descriptors: *Hydrologic cycle, *Wetlands, *Bogs, *Environmental effects, Model studies, Mathematical models, Precipitation(Atmospheric), Runoff, Evaporation, Groundwater, Rivers, Lakes, Humidity, Drainage, Soils, Environment modification.

The changes in the water budget and hydrologic cycle of regions and of landscape transformation under the effect of human activity in the excessively wet zone were investigated. Direct quantitative relations can be established between hydrothermal processes in the atmosphere and the structure of the landscape primarily for its biogenic components since adaptation of phytocenoses and a change in the chemical composition of soils occur relatively rapidly; for the biogenic components of the landscape, the time factor has another order of magnitude than for the transformation of morphological elements and of the physical properties of rocks underlying the soils. At the same time, the biogenic components of the landscape are the most important aspect of the human environment for the restoration and conservation of natural resources. Therefore, the effect of industrial activity must be estimated primarily for these components. (Sims-ISWS)
W78-08815

WATER IN CARBONATE ROCKS-U.S. PROGRESS IN PERSPECTIVE.
National Committee for the International Hydrological Decade, Wash DC.
For primary bibliographic entry see Field 2F.
W78-08819

GENERATION OF ANNUAL STREAMFLOWS USING A FILTERED FRACTIONAL GAUSSIAN NOISE MODEL,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-08826

STOCHASTIC MODELS OF FLOODS,
Montreal Univ. (Quebec) Ecole Polytechnique.
For primary bibliographic entry see Field 2E.
W78-09041

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
C. E. Anderson, H. P. Johnson, and W. L. Powers.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 2, p 314-320, March-April 1978. 8 fig, 2 tab, 16 ref.

Descriptors: *Water balance, *Iowa, *Soil moisture, *Runoff, *Model studies, Mathematical models, On-site data collections, Watersheds(Basins), Rainfall, Evaporation, Evapotranspiration, Winds, Air temperature, Humidity, Solar radiation, Infiltration, Soils, Loess, Agriculture.

A digital computer model was developed to simulate the moisture balance on an agricultural watershed, including interception, infiltration, surface-depression storage, surface runoff, soil moisture redistribution, deep percolation, and evapotranspiration. The model is for small homogeneous watersheds on deep, well-drained soils, and was calibrated and tested using data from small research watersheds operated in the deep loess hills in western Iowa. The model produced continuous simulation of the moisture balance during the growing season. The correlation between measured and predicted surface runoff depths for individual events during 4 yr of records was 0.80. The correlation between predicted soil moisture in the root zone and bi-weekly measurements during the same 4 yr was 0.91. (Sims-ISWS)
W78-09049

A DETERMINISTIC NON-LINEAR MODEL FOR RAINFALL-RUNOFF RELATION,
Meteorological Office, New Delhi (India).
M. K. Guha.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 28, No. 2, p 243-245, April 1977. 1 tab, 12 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Mathematical models, Hydrographs, Rainfall, Precipitation(Atmospheric), Runoff, Watersheds(Basins), Equations, Mathematics, Hydrology, *India.

A non-linear model for the rainfall run-off relation was discussed by using the Laplace's transform in the equation of continuity and storage. The equation of continuity was converted into a nth order algebraic equation. A simple integration method was indicated for the constant input function. Some particular cases were discussed as a verification of the result, and the linear model was deduced as a special case from the non-linear model. The results were in close agreement with that of observed hydrograph. (Sims-ISWS)
W78-09052

EDUCATION IN HYDROLOGY AND WATER RESOURCES IN THE UNITED STATES--1965-1974--AN OVERVIEW WITH RECOMMENDATIONS.
National Committee for the Internationa Hydrological Decade, Washington, DC. Work Group on Education and Training.
For primary bibliographic entry see Field 9A.
W78-09055

PREDICTING SEDIMENT YIELD FROM AGRICULTURAL LAND,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-09254

EVALUATION OF THE COMPONENTS OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Boise ID.
C. L. Hanson.
Paper No. 77-2533 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 8 p 7 fig, 4 tab, 8 ref.

Descriptors: *Model studies, Hydrology, *Simulation analysis, *Soil water, Runoff, *Idaho, Computer programs, *Watershed management, Arid lands, *USDAHL-74 model.

The USDAHL-74 revised model of watershed hydrology was evaluated on an 83-ha arid rangeland watershed in southwest Idaho. The model simulated soil water adequately, except during periods in late summer and fall. The model did not adequately simulate runoff. (Skogerboe-Colorado State).
W78-09258

A COMPARISON OF DETERMINISTIC MATHEMATICAL WATERSHED MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4D.
W78-09262

A CONTINUOUS WATER BUDGET MODEL FOR WESTERN KANSAS,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 2G.
W78-09263

MODELING INFILTRATION DURING A VARIABLE RAIN,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-09271

2B. Precipitation

CONFIDENCE LIMITS OF EXPECTED MONTHLY RAINFALL FOR SOME SELECTED STATIONS IN PENINSULAR MALAYSIA,
Malaysian Meteorological Service, Kuala Lumpur.
H. H. Chong, and L. J. Tick.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol 28, No 2, p 205-210, April 1977. 2 fig, 4 tab, 5 ref.

Descriptors: *Rainfall, *Analytical techniques, *Statistical methods, *Asia, Precipitation(Atmospheric), Data processing, Statistics, Agriculture, Weather, Meteorology, *Malaysia.

Monthly total rainfall data for 15 stations in Peninsular Malaysia were analyzed. The original rainfall data were normalized by Bartlett's square root transformation. Confidence limits of expected monthly rainfall were calculated from the transformation. Confidence limits of expected monthly rainfall were calculated from the transformed data and reconverted back to the original units. Possible applications of the confidence limits of expected monthly rainfall to agriculture were discussed briefly. (Sims-ISWS)
W78-08825

URBAN, TOPOGRAPHIC AND DIURNAL EFFECTS ON RAINFALL IN THE ST. LOUIS REGION,
Illinois State Water Survey, Urbana.
F. A. Huff, and J. L. Vogel.
Journal of Applied Meteorology, Vol. 17, No. 2, p 565-577, May 1978. 8 fig, 5 tab, 17 ref.

Descriptors: *Rainfall, *Missouri, *Cities, *Topography, *Effects, On-site investigations, Summer, Precipitation(Atmospheric), Rainfall intensity, Raingages, Networks, Industries, Data processing, Storms, Diurnal, Spatial distribution, Temporal distribution, Weather, Weather modification, Meteorology, *St. Louis(MO).

Analyses were made of the summer rainfall distribution (June-August) in 17 areas within the METROMEX network in St. Louis region. The areas were selected to represent areas subject to various types and degrees of inadvertent weather modification, plus a no-effect (control) area. The purpose was to determine the magnitude and relative intensity of urban and topographic effects on rain enhancement. Results indicated that the urban enhancement was greater than that associated with hills and river bluffs in the experimental region. The urban enhancement maximized northeast of the St. Louis urban-industrial complex where it was computed to be approximately 30-35%. The bluffs effect was calculated to be approximately 14%, and the hill effect was 9% for all rainstorms combined during the five summers. The urban and topographic enhancements were most pronounced in heavy storms, defined as those producing gage amounts of 25 mm or more. The enhancement maximized in June in the region of maximum urban effect, but occurred in July or August in other network areas subjected to urban or topographic influences. The urban effect was found to be associated with stimulation of rain output in ongoing storms, as opposed to an increase in frequency of storm events. Analyses of diurnal distributions showed that the major high in the Edwardsville area was produced by a double maximum of nearly equivalent magnitude in late afternoon and late evening. Further evidence was found that the urban effect is substantially greater than the topographic effect. During the diurnal peak rainfall periods, both the rainfall frequency and rainfall amounts were greater in the urban-effect areas, but the enhancement was produced largely by greater rain amounts. (Sims-ISWS)
W78-08830

URBAN EFFECTS ON SEVERE LOCAL STORMS AT ST. LOUIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Journal of Applied Meteorology, Vol. 17, No. 5, p 578-586, May 1978. 4 fig, 6 tab, 12 ref. NSF ENV73-07796.

Descriptors: *Storms, *Missouri, *Cities, Effects, On-site investigations, Summer, Thunderstorms, Precipitation(Atmospheric), Rainfall, Hail, Winds, Tornadoes, Cloudbursts, *Precipitation excess, *Precipitation intensity, Weather, Weather modification, Meteorology, *St. Louis(Mo).

As part of METROMEX, a five-year study of how St. Louis affects summer weather, studies were made of possible urban effects on severe local storm phenomena. Localized (within 40 km of the city) increases were found in various thunderstorm characteristics (about 10 to 115%), in hailstorm conditions (3 to 330%), in various heavy rainfall characteristics (35 to 100%) and strong gusts (90 to 100%). No indication of effects on tornado activity was found. The more substantial percentage increases were found in the expressions of storm intensity (very frequent thunder, hailfall impact energy and high rainfall rates). Urban-related increases in severe local storm conditions appeared at midday, were greatest in the evening, and ended by midnight. Urban-induced increases occurred with all synoptic weather types but were most frequent and intense with squall lines and cold fronts. Results suggested that urban-induced factors alter the microphysical and dynamic properties of clouds and storms. (Sims-ISWS)
W78-08831

AMAZON BASIN HYDROMETEOROLOGY,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13825, p 887-897, June 1978, 20 fig, 9 ref.

Descriptors: *Meteorology, *Wet seasons, *Tropical regions, River systems, Weather patterns, Rainfall, Dry seasons, Convection, Hydrology, *Amazon basin, *Brazil, Equatorial region, Equatorial trough.

The Amazon Basin lies across the equator, so the climate is established by the motion of the equatorial low pressure region. The result is a very rainy wet season and a very dry dry season with two transitions. The wet season is characterized by short periods of rain several times each day, with time distribution of rainfall similar to that expected for thunderstorms. The dry season frequently experiences less than 10 mm of rainfall. (Singh-ISWS)
W78-09038

ACCELERATIONS AND TERMINAL VELOCITIES OF RAINDROPS,
Asian Inst. of Tech. Bangkok (Thailand).
R. B. Banks.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE3, Technical Note, p 527-531, June 1978. 2 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Raindrops, *Velocity, *Impact(Rainfall), Analysis, Theoretical analysis, Rainfall, Mathematical studies, Equations, *Terminal velocity, Raindrip acceleration.

It appears desirable to obtain more information regarding the relationship between rainfall rates and surface reaeration coefficients. Accordingly, at the present time apparatus is being designed and assembled at the Asian Institute of Technology to carry out experiments to determine this relationship. On the basis of the results of the Thames Estuary study, it appears that the surface reaeration coefficient is directly proportional to the power of the rainfall. The main goal of the proposed study is to confirm or modify this correlation. In natural rainfalls, the velocity of a drop at impact is likely to be its terminal velocity. In the proposed experiments, because of insufficient head room in the laboratory, the drops, at least those of the larger diameters, will not yet have attained their terminal velocities. Therefore, the subject of accelerating raindrops was examined. A proposed equation was derived for computation of impact velocity. Impact velocities will be measured in the contemplated study to confirm the validity of the method of computation. (Humphreys-ISWS)
W78-09044

ACIDIC PRECIPITATION IN SOUTH-CENTRAL ONTARIO: RECENT OBSERVATIONS,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5A.
W78-09051

A DETERMINISTIC NON-LINEAR MODEL FOR RAINFALL-RUNOFF RELATION,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2A.
W78-09052

SOVIET DEVELOPMENTS IN WEATHER MODIFICATION, CLIMATE MODIFICATION, AND CLIMATOLOGY,
Informatics, Inc., Rockville, MD.
For primary bibliographic entry see Field 3B.
W78-09214

ECONOMIC BENEFITS OF CLIMATOLOGICAL SERVICES,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 6B.
W78-09226

RAINFALL SIMULATOR FOR EVALUATING EROSION RATES AND SEDIMENT FROM ROW SIDESLOPES,
Agricultural Research Service, oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 7B.
W78-09253

2C. Snow, Ice, and Frost

ICE ON RIVERS AND LAKES--A BIBLIOGRAPHIC ESSAY,
Geological Survey, Reston, VA. Water Resources Div.
E. R. Ficke, and J. F. Ficke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 528, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-95, October 1977. 173 p, 2 fig, 752 ref.

Descriptors: *Bibliographies, *Ice, *Lakes, *Rivers, Navigation, *Water quality, Ice breakup, Ice jams, Ice loads, Freezing, Melting, Publications, Reviews.

Ice on rivers and lakes influences design and construction of structures, operation of shipping, flow and circulation, water quality, and other factors related to the use of water. Interest in understanding these influences has led to many programs of data collection, research, and investigations for a century or more. The body of literature reporting on these studies includes several thousand items in textbooks, proceedings, journals, and technical reports. By far, the largest portion of the studies were in the United States, Canada, or the Soviet Union. The literature can be classified as dealing with basic characteristics of ice; freezing and melting processes and their prediction and control on rivers, and on lakes; effects of river and lake ice on navigation, flow, and structures; and influences of ice on chemical, biological, and thermal aspects of water quality. This bibliography cites 750 publications, but the body of literature is large and this bibliography is not exhaustive. It does provide, however, a cross section of the scope of work in the field. (Woodard-USGS)
W78-08837

WATER MOVEMENT AND INFILTRATION IN A FROZEN SOIL: THEORETICAL AND EXPERIMENTAL CONSIDERATIONS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08912

WATER CONDITIONS IN CALIFORNIA, SUMMARY OF CENTRAL VALLEY WATER CONDITIONS, JUNE 1, 1978.
Sacramento Dept. of Water Resources, CA.
For primary bibliographic entry see Field 4A.
W78-09050

INTERMITTENT ARCTIC STREAMS AND THEIR INFLUENCE ON LANDFORMS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 832, Price codes: A02 in paper copy, A01 in microfiche. Catena, Vol. 2, p. 181-192, 1975. 12 fig, 22 ref.

Descriptors: *Permafrost, *Arctic, *Intermittent Streams, *Geomorphology, *Alaska, Ice, Erosion, Deposition, Floodplains, Thermal erosion, Braided streams.

The weather and climate of the arctic to a great extent, control the nature of the processes responsible for morphologic changes in landforms. Much of the area in continuous permafrost experiences a repetition of short periods of heavy flooding separated by long periods of extremely low water. Floodplains, especially along braided streams, are exposed to wind action during most of the snow-free period. Thermal erosion and seasonally concentrated runoff are often responsible for rapid bank retreat along channels and for the construction of a variety of depositional forms many of which are highly ephemeral. Although floodwater is the main agent in erosion, transportation, and deposition, ice which moves downstream during breakup exerts an influence on many forms and is responsible for the presence of non-sorted, randomly located deposits on floodplains. Much morphologic change in the zone of continuous permafrost tends to be concentrated in a short period of time. (Stihler-Mass)
W78-09090

ROLE OF GROUND WATERS IN THE FORMATION OF THE CHEMISTRY OF RIVER WATERS DURING THE SUMMER-AUTUMN LOW-FLOW PERIOD IN PERMAFROST REGIONS, AS EXEMPLIFIED BY THE LENA-INDIGIRKA REGION,
For primary bibliographic entry see Field 2K.
W78-09209

AERIAL PHOTO INTERPRETATION OF A SMALL ICE JAM,
Cold Regions Research and Engineering Lab., Hanover, NH.
S. L. DenHartog.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 870, Price codes: A02 in paper copy, A01 in microfiche. Special Report 77-32, October 1977. 20 p, 3 fig. CWIS 31355.

Descriptors: *Ice jams, *Remote sensing, *Photography, *New Hampshire, Ice, Ice cover, Aerial photography, On-site investigations, Surveys, Analytical techniques, Rivers, *Plymouth(NH), *Pemigewasett River(NH).

Aerial photos of a small ice jam on the Pemigewasett River near Plymouth, New Hampshire, were taken three days after the jam and compared with photos taken after the ice went out. The winter photos show a marked and sudden decrease in floe size, apparently indicative of faster and longer movement of the ice. The spring photos show a number of shallows and obstructions that apparently had no effect on the ice movement. It was concluded that this jam was caused by a change in slope and subsequent reduction in velocity. (Humphreys-ISWS)
W78-09215

DEVELOPMENT OF METHODS FOR CALCULATION OF THE THERMAL REGIME OF ROCK-FILL DAMS IN REGIONS OF SEVERE CLIMATE,
Vsesoyuznyi Nauchno-Issledovatelskii. Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 8G.
W78-09218

CALCULATING THE ICE DISCHARGE FRONT FOR DAMS,
R. R. Chugayev.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 451, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 603, February 1977. 9 p, 1 fig, 3 ref. Translated from Sbornink trudov po gidrotekhnike i gidrostroetel'stva pri stroitel'stve plotin v surovykh klimaticheskikh usloviyakh, p 31-37, 1970.

Descriptors: *Dams, *Spillways, *Ice, Ice cover, Ice jams, Lake ice, Ice breakup, Rivers, Reservoirs, Dam design, Structures, Hydraulic structures, Civil engineering, Ice discharge.

Calculating the length of the so-caled ice discharge front for dams is of great practical significance. The question of this type of calculation, at the basis of which is the concept of the ice discharge capacity of the stream cross section, was discussed. (Sims-ISWS)
W78-09220

2D. Evaporation and Transpiration

EVALUATION OF EVAPORATION FROM LAKE ONTARIO DURING IFYGL BY A MODIFIED MASS TRANSFER EQUATION,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Marine Applications Div.
D. W. Phillips.
Water Resources Research, Vol. 14, No. 2, p 197-205, April 1978. 4 fig, 4 tab, 28 ref.

Descriptors: *Evaporation, *Lake Ontario, *Great Lakes, Environment, Fetch, Mass transfer, Turbulent flow, Winds, Stability, Water temperature, Equations, Hydrologic budget, Meteorology, *International Field Year, *Lake Hefner, Modified mass transfer technique, Turbulent energy flux, Multi-regression equations, Energy balance, Water budget methods.

Daily evaporation from Lake Ontario during the International Field Year for the Great Lakes (April 1972 to March 1973) was computed by a modified/mass transfer technique. Turbulent energy flux was calculated by using upwind land station data and the surface water temperature at 88 grid points on the lake. Wind speed and humidity at each grid point were determined through multiregression equations that took into account stability, fetch, and water temperature. Daily, monthly, and annual evaporation amounts obtained by this study were compared to amounts obtained by conventional mass transfer, energy balance, and terrestrial water budget methods. discrepancies in the results of the various approaches were examined and discussed. (Roberts-ISWS)
W78-09039

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-09049

MODEL FOR SIMULATING SOIL-WATER CONTENT CONSIDERING EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-09206

EVAPORATION FROM FORESTS,
Institute of Hydrology, Wallingford (England).
J. H. C. Gash, H. R. Oliver, W. J. Shuttleworth, and J. B. Stewart.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 2, p 104-110, March 1978. 1 fig, 27 ref.

Descriptors: *Evaporation, *Forest watersheds, *Water loss, Hydrology, Forests, Watersheds(Basins), Transpiration, Interception, Evaluation, Estimating, Reviews, *Great Britain, *Wales.

Experimental and theoretical evidence has shown that the evaporation from forests is a much more complex process than that from grass land. The rates of evaporation of intercepted and transpired water are similar for grass land, and these components of the total evaporation need not be treated separately. In the United Kingdom, the annual evaporation from grass land can be estimated with adequate accuracy by the Penman formula. The rates of evaporation of intercepted and transpired water are different for forests, even under the same meteorological conditions, and must be estimated or measured separately. Failure to account for this difference will introduce an underestimation of the water lost from the forest which may be effectively zero in low rainfall areas such as East Anglia, but may rise to 100% in the high rainfall areas of Wales. Suitable models are now available for estimating evaporation from forests. After calibration against measurements of actual transpiration and of interception, these models can provide a major improvement on the simpler Penman formula in estimating evaporation. Further improvements in knowledge of the evaporation from forests will be obtained by the use of instruments to measure evaporation directly. For the measurements to be of use to hydrologists, these instruments will have to be sufficiently robust and reliable to operate in the field for long periods unattended. Their use would not only assist in understanding the problem of forest evaporation, but also in understanding evaporation from the whole spectrum of crops, of which grass land and forest are merely extremes. (Humphreys-ISWS)
W78-09212

ESTIMATION OF POND EVAPORATION IN THE GEORGIA COASTAL PLAIN,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, and L. E. Asmussen.
Report ARS-S-89, March 1976. 7 p, 4 tab, 20 ref.

Descriptors: *Evaporation, *Georgia, *Ponds, *Coastal plains, *Estimating, Analysis, Analytical techniques, Estimating equations, Water loss, Statistical methods, Methodology, Data processing, Correlation analysis, Penman method, Weather Bureau method.

Various techniques to estimate pond evaporation were compared on the basis of their ability to reproduce observed evaporation rates from a floating pan. Methods that use only one meteorological factor provided correlation coefficients that were only slightly smaller than those obtained with methods requiring values for two to four meteorological factor. Factor analysis indicated that radiation, humidity, and air temperature have similar effects on the variation in floating-pan evaporation; thus, it is not necessary to use all three factors for predicting evaporation rates. Correlation analysis, sensitivity analysis, and factor analysis indicated that variation in air speed has little effect on variation in evaporation. (Humphreys-ISWS)
W78-09224

2E. Streamflow and Runoff

RECONSTRUCTION OF RIVER DISCHARGES IN THE CONGO BASIN,
Moscow State Univ. (USSR). Dept. of Hydrology.
P. V. Yefremov.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 323-325, 1976. 1 fig, 3 tab, 5 ref. Translated from Vestnik Moskovskogo Universiteta, Geografiya, No. 5, p 115-118, 1976.

Descriptors: *Rivers, *Discharge(Water), *Africa, Data processing, Watersheds(Basins), Runoff, Hydrology, *Congo River basin.

There is still little hydrologic information on the basin of the Congo, the second largest river in Africa. Yearbooks published from 1948 to 1961 contain information on the stages of this river and its tributaries. All the data are reduced to the first and 15th day of each month, and no monthly and annual averages are given. Yearbooks for 1958 and 1959 include, in addition to data on stages, information on daily discharges for these two years at five gaging stations. To reconstruct the runoff records for the Congo, Luaba, and Kasai rivers, data on their stages from 1932 to 1957 were used. Information on daily stages at Kinshase, Kindu, Ubundu, Kutu-Moke, and Ilebo has been published in the hydrologic yearbooks on the Congo basin since 1951. Only the stages on the first and 15th of each month are given for the period 1932-1950. As a result of the reconstruction of data on the runoff of rivers in the Congo basin, information also was obtained on mean annual discharges. Data on the annual runoff of the Congo River were particularly interesting because this river contributes about 40% of the total runoff from the African continent into the ocean according to the data of different researchers. (Sims-ISWS)
W78-08814

LOW-SPEED CALIBRATION OF THE BENDIX Q15R CURRENT METER,
Argonne National Lab., IL. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 7B.
W78-08824

GENERATION OF ANNUAL STREAMFLOWS USING A FILTERED FRACTIONAL GAUSSIAN NOISE MODEL,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan, and T. C. McMahon.
Journal of Hydrology, Vol 37, No 1/2, p 13-21, April 1978. 1 fig, 2 tab, 10 ref.

Descriptors: *Australia, *Synthetic hydrology, *Analytical techniques, *Computer models, *Data processing, Annual, Streamflow, Statistics, Markov processes, Methodology, Model studies, *Fractional Gaussian noise models, *Wilson-Hilferty transformation, Log-transformation, Hurst coefficient.

Filtered fractional Gaussian noise models were used to generate annual streamflows for 13 Australian streams. Problems involved with using the Wilson-Hilferty transformation and Kirby's modifications were noted, and as a consequence, a log-normal transformation was adopted. Comparison of the various parameters obtained from the historical and generated sequences showed that even though the value of the Hurst coefficient (h) was preserved in some cases, other parameters were not preserved very well. (Singh-ISWS)
W78-08826

MARKOVIAN INPUTS AND THE HURST PHENOMENON,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
F. L. S. Gomide.
Journal of Hydrology, Vol 37, No 1/2, p 23-45, April 1978. 9 fig, 1 tab, 23 ref. GK-3152X.

Descriptors: *Markov processes, *Synthetic hydrology, *Statistical methods, Analytical techniques, Storage requirements, Streamflow, Computers, Methodology, Equations, Mathematical studies, *Hurst's phenomenon, Adjusted range, Asymptotic mean range.

Studies of storage capacity of reservoirs lead to the problem of discussing the Hurst phenomenon. In this paper, Hurst's theoretical argument was extended to the case of Markovian inputs. It was shown that processes with a markovian correlation structure preserve the Hurst phenomenon as a long-term transient effect. Other works on the Hurst phenomenon were discussed briefly. The exact distribution of Hurst's conditioned range also was presented. (Singh-ISWS)
W78-08827

LOW-FLOW CHARACTERISTICS OF PENNSYLVANIA STREAMS,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08846

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1977,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08847

PRELIMINARY EVALUATION OF FLOOD FREQUENCY RELATIONS IN THE URBAN AREAS OF MEMPHIS, TENNESSEE,
Geological Survey, Memphis, TN. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-08850

MAUMEE RIVER BASIN LEVEL-B STUDY, WATER SUPPLY TECHNICAL PAPER,
Geological Survey, Indianapolis, IN. Water Resources Div.
W. G. Weist, Jr., M. Planert, and L. D. Arihood.
Great Lakes Basin Commission, Ann Arbor, Michigan, MRB Series No 16, August 1976. 48 p, 9 fig, 13 tab, 47 ref.

Descriptors: *Water supply, *Surface waters, Groundwater resources, *Water quality, *Available water, Water users, Water demand, Projections, Indiana, Michigan, Ohio, *Maumee River basin.

The Maumee River basin includes 8,923 square miles in northwestern Ohio, northeastern Indiana, and southeastern Michigan. Several periods of glaciation have left the basin nearly flat, resulting in drainage and flooding problems. Because much of the glacial deposits are fine grained, erosion and sedimentation also are problems. The basin has adequate water to meet anticipated municipal, industrial, and rural needs through the year 2000. Total water needs in 1975 are estimated to be 1,217 million gallons per day. By 2000 these needs are estimated at 1,447 million gallons per day. Surface-water sources, including Lake Erie, will meet about 90 percent of these needs. Water is available from unconsolidated aquifers and from limestone and dolomite aquifers. In general, unconsolidated deposits are the source of ground water in the part of the basin north of the Maumee River, and bedrock south of the river. Ground water in the basin is generally hard enough to need softening. In places, iron, sulfate, and sulfide concentrations are objectionably high. Quality of surface water is similar to that of ground water, although the dissolved-solids concentration of surface water is generally lower than that of ground water. (Woodard-USGS)
W78-08857

DEVELOPING ZONE CHARACTERISTICS IN AERATED FLOWS,
Indian Inst. of Tech. Madras. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-09030

WAVE PROPAGATION IN STEEP ROUGH MOUNTAIN STREAMS,
Forests Commission of Victoria, Melbourne (Australia).
L. J. Bren, and A. K. Turner.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13780, p 745-754, May 1978. 6 fig, 7 ref, 2 append.

Descriptors: *Waves(Water), *Australia, *Channel flow, *On-site tests, *Gradients(Streams), Froude number, Reynolds number, Continuity equation, Hydraulics, Analytical techniques, Simulation, *Rough mountain stream, *Kinematic wave theory, Storage-discharge relationship.

Kinematic wave theory was tested along a small, steep, rough mountain stream in a forest environment. The necessary parameters were measured independently over a length of natural channel; and the derived relationship was used to compare physically generated hydrographs to simulated hydrographs, the agreement being good. Certain features of the hydrographs could not be simulated by the theory without a more complex discharge-storage relationship for the channel. Perturbations in a flow regime caused by the measurement technique were transmitted downstream in a stable manner. (Singh-ISWS)
W78-09032

AMERICAN DEVELOPMENTS IN HYDRAULIC MEASUREMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W78-09036

DETERMINATE HYDRAULIC GEOMETRY OF RIVER CHANNELS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 8B.
W78-09037

STOCHASTIC MODELS OF FLOODS,
Montreal Univ. (Quebec) Ecole Polytechnique.
P. Todorovic.
Water Resources Research, Vol. 14, No. 2, p 345-356, April 1978. 7 fig, 1 tab, 26 ref.

Descriptors: *Floods, *Time series analysis, *Model studies, *Flood frequency, Distribution, Hydrology, Streamflow, Methodology, Analytical techniques, *Partial duration series, Flood volume, Flood duration.

Essentially, there are two different approaches to the problem of flood analysis. One approach corresponds to the streamflow annual flood series (AFS), and the other to the streamflow partial duration series (PDS). Here characteristics of these approaches were discussed. Three stochastic models of floods presented in this paper were based on the streamflow PDS. Each model depends on certain assumptions concerning properties of exceedances of a base level x sub o. The second and third models represent improvement vis-a-vis the first one in the sense that they are based on less restrictive assumptions. The time when the largest exceedance occurs also was studied, and the distribution of this time was determined. Each exceedance is characterized, roughly speaking, by its duration and its volume. Here a method was proposed for determining the distribution of this volume. The distribution function of the largest volume in an interval of time (0,t) also was given. Good agreement between theoretical and observed distributions showed that the assumptions concerning the exceedances are not unduly restrictive. (Singh-ISWS)
W78-09041

TRANSIENT MIXING IN RIVER CHANNELS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-09042

DISCHARGE-DEPTH EQUATION FOR SHALLOW FLOW,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
A. K. Turner, K. J. Langford, M. Win, and T. R. Clift.
Journa of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13626, p 95-110, March 1978. 9 fig, 3 tab, 20 ref, 2 apend.

Descriptors: *Flow, *Overland flow, *Roughness(Hydraulic), *Model studies, Mathematical models, Laboratory tests, Vegetation, Crops, Soils, Shallow waterm, Sheet flow, Discharge(Water), Retardance, Runoff, Surface runoff, Equations.

The application of a discharge-depth equation (with variable coefficient and exponent) was recommended for shallow flows of water over soil and through vegetation. The more flexible nature of this equation over the commonly used channel flow equations was considered, and typical values were given for three conditions, viz, bare uneven soil, artificial vegetation, and pasture and crop covers growing on a sandy soil. (Sims-ISWS)
W78-09045

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Ledolter.
Research Memorandum RM-77-11, February 1977. 33 p, 21 ref, append.

Descriptors: *Hydrology, *Time series analysis, *Stochastic processes, *Multivariate autoregressive model, *Streamflow, Methodology, Estimating, Autocovariance, Diagnostic checking, Model studies, Equations, System analysis.

This paper discusses stochastic models for vector processes, in particular the class of multivariate autoregressive moving average models. Special cases of this class have been discussed in the literature on multi-site streamflow generation, and it is shown how these can be brought into a general framework. An iterative model building procedure, consisting of model specification-estimation-diagnostic checking, is stressed. Results on model specification are given, and it is shown how partial autocovariance matrices can be used to check whether multivariate autoregressive models provide adequate representation for (standardized) streamflow sequences. Furthermore, estimation of parameters in multivariate autoregressive moving average models is discussed, and it is mentioned that moment estimators can be inefficient when moving average parameters are present. An approximate maximum likelihood estimation procedure is suggested. The concluding section summarizes important practical implications for hydrologists. (Graf-Cornell)
W78-09177

AN OPTIMAL ADAPTIVE PREDICTION ALGORITHM FOR REAL TIME FORECASTING OF HYDROLOGIC TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09193

A FEATURE PREDICTION MODEL IN SYNTHETIC HYDROLOGY BASED ON CONCEPTS OF PATTERN RECOGNITION,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
U. S. Panu, and T. E. Unny.
Water Resources Research, Vol. 14, No. 2, p 335-344, April 1978. 7 fig, 4 tab, 23 ref.

Descriptors: *Synthetic hydrology, *Hydrologic data, *Mode studies, *Stochastic processes, Streamflow, Time series analysis, Methodology, Hydrology, *Feature prediction model, *Saskatchewan River, Pattern recognition.

It is reasonable to consider that sequences of hydrologic data corresponding to daly, weekly, or monthly measurements occur in well-defined groups. These groups possess collective properties of the data forming them. Such a collection of properties can be called a hydrologic pattern. A pattern is a description of an object; and the objects of concern in this paper were groups of data on hydrologic phenomena observed at regular time intervals. Hydrologic patterns describing each of these groups are expressed by n appropriate properties. Further, the dimensionality, n in number, can be reduced by considering only those characteristic properties, m in number (m less than or = to n), that are common in all hydrologic patterns of the same category. These m characteristic properties are called features. A procedure was presented to extract information present within patterns and among patterns of the pertinent hydrologic data. In addition, on the basis of the above information, a zero-order Markov feature prediction model was postulated. The basic assumptions of the model and their implications were presented. The model was applied to South Saskatchewan River flow data in an effort to demonstrate its usefulness in real situations. (Singh-ISWS)
W78-09201

CHARACTERIZING LOW FLOWS USING THRESHOLD LEVELS,
Lehigh Univ., Bethlehem, PA. Fritz Engineering Lab.
R. N. Weisman.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. IR2, Technical Note, p 231-235, June 1978. 4 fig, 4 ref, 1 append.

Descriptors: *Low flow, *Low-flow frequency, *Statistical methods, *Analytical techniques, Average flow, Analysis, Streamflow, Frequency, Flow duration, Threshold flow.

This note outlined a technique of presenting low flow data. The technique is applicable in situations where duration of flow below a critical threshold is an important parameter. Once a threshold flow rate, Q, is specified, a streamflow record of average daily flows can be scanned to obtain the runs below the threshold value. A run, in this context, is the number of days that the average daily flow remains below Q. For each year of record, the longest run duration was defined as the extreme value run, R. The set of extreme value runs, one vaue for each year of record, form a sample of extreme value data. These data can be assigned a probability or return period using a plotting position formula. This results in a plot of run duration R versus return period T for the given vaue of threshold of Q. Many aspects of this technique remain to be explored, such as using a partial series and applying a probability distribution to extreme value runs. However, even in its simplest form as presented, it may prove meaningful to water resource planners. (Humphreys-ISWS)
W78-09202

FLOOD PROFILES IN COMBINED TIDAL-FRESHWATER ZONES,
Agency for International Development, Dacca (Bangladash).
For primary bibliographic entry see Field 2L.
W78-09204

SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 7B.
W78-09207

A COMPARISON OF DETERMINISTIC MATHEMATICAL WATERSHED MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4D.
W78-09262

2F. Groundwater

WATER IN CARBONATE ROCKS-U.S. PROGRESS IN PERSPECTIVE.
National Committee for the International Hydrological Decade, Wash DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 548, Price codes: A04 in paper copy, A01 in microfiche. Final Report of the Work Group on the Hydrology of Carbonate Terranes of the US. National Committee for theInternational Hydrological Decade, Naticnal Academy of Sciences, Wash, D.C., 1976. 48 p, 1 append. NSF C-310.

Descriptors: *International Hydrological Decade, *Hydrology, *Carbonate rocks, *Aquifers, Karst hydrology, Education, Training, Research priorities, Groundwater, Water resources, Information exchange, Programs, *Carbonate hydrology, Research needs.

Carbonate terranes have been developed only infrequently without unexpected, often costly, undesirable results. Carbonate terranes are often rugged, topographically isolated, and have undependable or localized water supplies. They are characterized by thin, patchy soils, and many carbonate terranes underlie poor or impoverished lands. Many striking exceptions exist, such as the Floridan Aquifer in the southeastern United States, the Edwards in Texas, and other elsewhere around the globe. In many regions, carbonate rock aquifers are the last major sources of groundwater that have not been highly exploited, and their real potential is only now beginning to be considered in the western United States, Northern Mexico, the Middle East, North Africa, and elsewhere. To resolve the practical problems that will be encountered in the development of carbonate terranes, management will require a sound base of scientific knowledge, including hydrological aspects. Specific recommendations were made for educational needs; research needs; transfer, adoption, and use of existing technologies; a center for disciplinary information exchange and assistance; and a committee on the hydrology of carbonate rocks. (Humphreys-ISWS)
W78-08819

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08839

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, MAY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08843

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
D. R. Rima, M. S. Moran, and E. J. Woods.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 171, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 77-86, July 1977. 76 p, 31 fig, 10 tab, 15 ref. TN 74-021.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Limestones, *Water yield, *Water quality, Karst, Groundwater movement, Groundwater recharge, Hydrogeology, Water wells, Groundwater availability, Tennessee, *Murfreesboro area.

Ground water occurs in the Murfreesboro area in solution openings in the otherwise dense paleozoic limestones that underlie most of central Tennessee. Test drilling based on conceptual models of ground-water occurrence in carbonate-rock aquifers indicate that multimillion-gallon-per-day supplies could be developed from strategically located production wells in the Shiloh and Overall Creek localities. The Shiloh locality which encompasses an elongated synclinal depression in the bedrock has the potential to supply 5 to 8 million gallons per day. The Overall Creek locality which straddles a joint-oriented lineament has the potential to supply 3 to 6 million gallons per day. Some local springs could be used as a supplemental source of potable water, but storage facilities would be needed to offset poorly sustained flows during dry periods. An exception is Fox Camp Spring which appears to be a natural well. The quality of ground water in the Murfreesboro area is typically hard, moderately mineralized and moderately to highly alkaline. Although the shallowest aquifers are subject to bacterial contamination from the land surface, aquifers beneath a depth of 100 feet are prone to yield potable water. (Woodard-USGS)
W78-08848

HYDRAULIC CONDUCTIVITY AND WATER QUALITY OF THE SHALLOW AQUIFER, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. B. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 292, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-119, April 1977. 22 p, 10 fig, 3 tab, 13 ref.

Descriptors: *Aquifer characteristics, *Logging(Recording), *Hydraulic conductivity, *Water quality, *Water yield, Water wells, Hydrogeology, Groundwater movement, Permeability, Palm Beach County(Fla), *Florida.

Subsurface geophysical logs were correlated with logs of drill cuttings to determine the permeability of selected zones of the shallow aquifer, Palm Beach County, Fla. The hydraulic conductivity of the aquifer is estimated to range from 1 to 130 feet per day, based on lithology and physical properties. The yield of wells penetrating this aquifer ranges from 100 to more than 1,000 gallons per minute. Water samples were collected from different depths throughout the county and analyzed for chemical constituents. Stiff diagrams illustrate the changes in types of water by depth and area. Water of suitable quality is in the eastern parts of the county. In this area the aquifer is the thickest and most permeable. The concentration of chemical constituents in the water increase in a westerly direction. The water in the western parts of the county is unsuitable for most purposes. (Woodard-USGS)
W78-08854

ALTITUDE AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER, DUVAL COUNTY, FLORIDA,
Geological Survey, Jacksonville, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08855

THE WINONA-TALLAHATTA AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Division.
For primary bibliographic entry see Field 7C.
W78-08856

NUMERICAL MODEL FOR SATURATED-UNSATURATED FLOW IN DEFORMABLE POROUS MEDIA. 2. THE ALGORITHM,
California Univ., Berkeley. Lawrence Berkeley Lab.
T. N. Narasimhan, P. A. witherspoon, and A. L. Edwards.
Water Resources Research, Vol. 14, No. 2, p 255-261, April 1978. 3 fig, 8 ref.

Descriptors: *Numerical analysis, *Mathematical models, *Porous meida, *Saturated flow, *Unsaturated flow, *Algorithms, Equations, Groundwater movement, Aquifer characteristics, Boundaries(Surfaces), *Integrated-finite-difference method, Explicit-implicit iteration.

An integrated finite difference algorithm was presented for numerically solving the governing equation of saturated-unsaturated flow in deformable porous media. In recognition that stability of the explicit equation is a local phenomenon, a mixed explicit-implicit procedure was used for marching in the time domain. In this scheme, the explicit changes in potential are first computed for all elements in the system, after which implicit corrections are made only for those elements for which the stable time step is less than the time step being used. Time step sizes are controlled automatically in order to optimize the number of iterations, to control maximim change in potential during a time step, and to obtain desired outputs. Time derivatives, estimated on the basis of system behavior during two previous time steps, are used to start the iteration process and to evaluate nonlinear coefficients. Boundary conditions and sources can vary with time or with the dependent variable. Input data are organized into convenient blocks. Accuracy of solutions can be affected by modeling errors, different types of truncation errors, and convergence errors. The algorithm constitutes an efficient tool for analyzing linear and nonlinear fluid flow problems in multidimensional heterogeneous porous media with complex geometry. An important limitation is that the model cannot conveniently handle arbitrary anisotropy and other general tensorial quantities. (Visocky-ISWS)
W78-09195

ANALYSIS OF DYNAMIC AQUIFERS WITH STOCHASTIC FORCING FUNCTION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.; and Department of the Environment, Ottawa (Ontario) Inland Waters Directorate.
B. Sagar.
Water Resources Research, Vol. 14, No. 2, p 207-216, April 1978. 6 fig, 28 ref.

Descriptors: *Saturated flow, *Aquifers, *Mathematical models, *Stochastic processes, Model studies, Mathematical studies, Analytical techniques, Analysis, Flow, Porous media, Groundwater movement, Equations, Markov processes, Probability, Stochastic forcing function.

The existence of different types of uncertainties in deterministic aquifer models and the need of quantitatively accounting for them were discussed. The case of one-dimensional saturated flow represented by a linear parabolic partial differential equation with a stochastic forcing function was analyzed. The dependence of the autocovariance function of the hydraulic head on properties of the forcing function and nature of the aquifer was brought out. (Humphreys-ISWS)
W78-09197

A FULLY COUPLED CONSOLIDATION MODEL OF THE SUBSIDENCE OF VENICE,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
R. W. Lewis, and B. Schrefler.
Water Resources Research, Vol. 14, No. 2, p 223-230, April 1978. 9 fig, 2 tab, 10 ref.

Descriptors: *Subsidence, *Model studies, *Consolidation, *Potentiometric level, Groundwater, Water table, Aquifers, Theoretical analysis, Analytical techniques, Mathematical models, Compressibility, Flow, Drawdown, Pumping, Foreign research, Foreign countries, *Italy, *Venice(Italy).

The subsidence of Venice, a well-known historical town in Italy, is caused by the extensive withdrawal of groundwater in its industrial area, Marghera. A fully coupled finite element consolidation model was presented to simulate the subsidence and the piezometric decline in the considered area. The model shows clearly the short time delay between changes in the withdrawal rate in Marghera and the resulting hydraulic head decline and subsidence in Venice. A comparison also was made between the coupled model and an analysis in which the flow region was analyzed separately from the subsidence calculations. (Humphreys-ISWS)
W78-09198

STOCHASTIC ANALYSIS OF SPATIAL VARIABILITY IN SUBSURFACE FLOWS. 1. COMPARISON OF ONE-AND THREE-DIMENSIONAL FLOWS,
New Mexico Inst. of Mining and Technology, Socorro.
A. A. Bakr, L. W. Gelhar, A. L. Gutjahr, and J. R. MacMillan.
Water Resources Research, Vol. 14, No. 2, p 263-271, April 1978. 4 fig, 23 ref.

Descriptors: *Stochastic processes, *Hydraulic conductivity, *Subsurface flow, *Aquifers, Groundwater movement, Statistical models, Equations, Hydraulic gradient, Mathematical models, Monte Carlo method, Spatial variability, Covariance function, Spectral analysis.

The complex variation of hydraulic conductivity in natural aquifer materials is represented in a continuum sense as a spatial stochastic process which is characterized by a covariance function. Assuming statistical homogeneity, the theory of spectral analysis was used to solve perturbed forms of the stochastic differential equation describing flow through porous media with randomly varying hydraulic conductivity. From analyses of unidirectional mean flows which are perturbed by one- and three-dimensional variations of the logarithm of the hydraulic conductivity, local relationships between the head variance and the log conductivity variance were obtained. The results showed that the head variance produced by three-dimensional statistical isotropic conductivity perturbations is only 5% of that in the corresponding one-dimensional case. The head variance is also strongly dependent on the correlation distance of the log conductivity covariance function. These results emphasized the importance of including spatial correlation structure and multidimensional effects in stochastic simulation of groundwater flow. (Visocky-ISWS)
W78-09199

THEORY OF FLOW IN UNCONFINED AQUIFERS BY INTEGRODIFFERNTIAL EQUATIONS,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigaciones en Matematicas Aplicadas y en Sistemas.
I. Herrera, A. Minzoni, and E. Z. Flores.
Water Resources Research, Vol. 14, No. 2, p 291-297, April 1978. 3 fig, 1 tab, 18 ref, 1 append.

Descriptors: *Aquifers, *Drawdown, *Theoretical analysis, *Mathematical models, Groundwater movement, Unsteady flow, Groundwater, Flow, Compressible flow, Porous media, Analytical techniques, Mathematical studies, Equations, Compressibility, Integrodifferential equations, Leaky aquifers.

It was shown that when the diffusion of the deviation of the drawdown from its average value can be neglected, the unsteady flow in unconfined aquifers is governed by an integrodifferential equation. For incompressible flow, this equation reduces the Boulton's delayed yield equation with epsilon = 3. When the flow is compressible, the kernel can be approximated by Boulton's delayed factor in a range of times whose lower limit approaches zero with the compressibility. (Humphreys-ISWS)
W78-09200

AUTOMATIC ANALYSIS OF PUMPING TEST DATA-APPLICATION TO THE BOULTON AND HANTUSH HYPOTHESES (ANALYSE AUTOMATIQUE DES DONNEES DE POMPAGE D'ESSAI-APPLICATION AUX HYPOTHESES DE BOULTON ET D'HANTUSH),
Lille-1 Univ., Villeneuve d'Ascq (France).
J. Mania, and M. Sucche.
Journal of Hydrology, Vol. 37, No. 1/2, p 185-194, April 1978. 3 fig, 2 tab, 11 ref.

Descriptors: *Drawdown, *Aquifers, *Model studies, *Analytical techniques, Theoretical analysis, Water wells, Porous media, Mathematical models, Equations, Flow, Data processing, Artesian aquifers, Leakage, Test wells, Testing curves, *Drawdown curves, Leaky artesian aquifers.

Classical analysis of pumping test curves under unsteady-state flow conditions with constant discharge rate in a fully penetrating well is based on a manual graphical comparison of drawdowns with theoretical standard curves. This procedure leaves a relative subjectivity to the operator. A more rigorous method was proposed: automatic analysis of drawdown curves. The principle of automatic analysis is based on the minimization of differences between observed drawdowns and those calculated theoretically according to a nonlinear law. The authors used the iterative process in successive degrees of Gauss-Newton applied to the evaluation of least-squares errors for a nonlinear regression. The application of this method to two hydrogeological mechanisms described by N.S. Boulton and M.S. Hantush permits a quick and direct evaluation of the hydraulic parameters of the aquifer by means of partial derivatives with relation to those parameters of the theoretical function. This latter was determined as a generalized integral of a function depending on four (first case) or five (second case) parameters. Permutations of the derivations and integration were justified. At the level of numerical calculation, the difficulty is to evaluate with sufficient precision the generalized integrals containing Bessel function. Applications of automatic analysis have been carried out and were discussed. (Humphreys-ISWS)
W78-09205

ROLE OF GROUND WATERS IN THE FORMATION OF THE CHEMISTRY OF RIVER WATERS DURING THE SUMMER-AUTUMN LOW-FLOW PERIOD IN PERMAFROST REGIONS, AS EXEMPLIFIED BY THE LENA-IN-DIGIRKA REGION,
For primary bibliographic entry see Field 2K.
W78-09209

SEASONAL VARIATIONS OF TRITIUM AND OTHER CONSTITUENTS IN GROUNDWATER IN THE CHALK NEAR BRIGHTON, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5A.
W78-09210

2G. Water In Soils

COMPACTION EFFECTS ON THE HYDRAULIC CONDUCTIVITY OF A CLAY SOIL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering.
E. Douglas, and E. McKyes.
Soil Science, Vol 125, No 5, p 278-282, May 1978. 6 fig, 7 ref.

Descriptors: *Compaction, *Compacted soils, *Hydraulic conductivity, *Clays, Unsaturated flow, Laboratory tests, Equations, Saturated soils, Porosity, Pressure, Hydraulic gradient, Bulk density, Soil moisture, Darcys Law, Effective porosity.

Unsaturated hydraulic conductivities of laboratory-compacted samples of Ste. Rosalie clay were measured, and the values obtained were corrected for the effective changing porosity under increasing pressure gradients. An equation was presented that permits predicting the corrected hydraulic conductivity as a function of compaction in terms of porosity. (Visocky-ISWS)
W78-08828

FRONTAL MOVEMENT OF AQUEOUS SOLUTIONS DURING REDISTRIBUTION THROUGH AIR-DRY SAND COLUMNS AS A FUNCTION OF COLUMN LENGTH AND TIME,
Battelle Pacific Northwest Labs., Richland, WA.
R. C. Routson, and D. J. Brown.
Soil Science, Vol 125, No 5, p 320-325, May 1978. 5 fig, 3 tab, 19 ref.

Descriptors: *Aqueous solutions, *Sands, *Laboratory tests, *Soil water movement, Sorption, Soils, Depth, Graphical analysis, Equations, Wetting, Time, Frontal movement, Sand columns.

The frontal movement during redistribution of unsorbed waste fronts through an air-dried sand was measured as a function of time and column length for columns 25-200 cm long. All column data fit an equation of the form S = Ex T to the F power. S was found to be significantly correlated with T(at the 1% level). The equation was normalized by dividing S and E by the column length. When this was done, data for all columns fit a single normalized equation. Use of this equation allows estimation of the shortest possible time necessary for the front of a pulse of waste solution to reach a given depth in a homogeneous soil system. (Visocky-ISWS)
W78-08829

MOISTURE PROFILES DURING STEADY VERTICAL FLOWS IN SWELLING SOILS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
J. V. Giraldez, and G. Sposito.
Water Resources Research, Vol. 14, No. 2, p 314-318, April 1978. 3 fig, 1 tab, 21 ref.

Descriptors: *Soil moisture, *Soil water movement, *Mathematical models, *Equations, Unsaturated flow, Computer models, Steady flow, Loam, Model studies, *Swelling soil, *Moisture profiles.

Practical working equations for numerically describing soil moisture profiles in homogeneous swelling soils during vertical flows were developed. These equations were solved on a computer with soil water and swelling curve data appropriate to Rideau clay loam, which was taken as a typical example of a swelling soil. Unsaturated swelling soils were shown to exhibit either xeric or hydric profiles for downward flows, whereas for upward flows they exhibit only a xeric profile, just as rigid soils do. On the other hand, saturated swelling soils were shown to have hydric profiles in the downward flow situation and either hydric or xeric profiles during upward flows. The overburden or 'envelope pressure' potential was shown to exert a great influence, in almost all circumstances, in reducing the maximum evaporative flow from a shallow water table in a swelling soil as compared to the equivalent nonswelling case. (Visocky-ISWS)
W78-08833

ADSORPTION OF ALUMINUM BY A SMECTITE: I. SURFACE HYDROLYSIS DURING CA2(+)(-)AL3(+) EXCHANGE,
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
P. R. Bloom, M. B. McBride, and B. Chadbourne.
Soil Science Society of American Journal, Vol. 41, No. 6, p 1068-1072, Novenmber-December, 1977. 1 fig, 6 tab, 16 ref.

Descriptors: *Adsorption, *Aluminum, *Montmorillonite, *Clays, Soils, Soil chemistry, Soil properties, *Smectite, Hydrolysis,(Surface), *Ion exchange, *Calcium.

The exchange of Ca by Al in montmorillonite suspensions adjusted to low pH (approximately equal to 4) was investigated by measurement of Ca, Al, and pH in the solution phase before and after the addition of clay. Adsorption of Al was accompanied by a release of protons to solution, indicating that the clay surfaces promoted hydrolysis of Al3+ when only partial coverage of exchange sites by Al had occurred. Calculations showed a two- to nine fold increase in the degree of hydrolysis at the surface relative to the value for solution. (See also W78-08907) (Skogerboe-Colorado State)
W78-08906

ADSORPTION OF ALUMINUM BY A SMECTITE: II. AN AL3(+)(-) CA2(+),
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
M. B. McBride, and P. R. Bloom.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1073-1077, November-December, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: Model studies, Aluminum, *Montmorillonite, *Clays, Soils, Soil chemistry, Soil properties, *Ion exchange, *Adsorption, *Smectite, Hydrolysis.

The adsorption of Al by Ca2+-montmorillonite has been found to be described by a Langmuir-type equation in which the activity of Al3+ in solution is a function of the coverage of the mineral surfaces by Al. The classical mass-action equations were inadequate in describing the exchange reaction where the Ca2+ activity was allowed to vary, weighting the effect of the Ca2+ ion activity on the equilibrium too heavily. The model suggests that the relative solutionlike nature of adsorbed Ca2+ compared to the much more strongly adsorbed Al3+. Hydrolysis and precipitation reactions of Al3+ at higher pH complicated the exchange model by introducing significant quantities of adsorbed hydroxyl-Al into the system. (See also W78-08906) (Skogerboe-Colorado State)
W78-08907

PHOSPHATE ADSORPTION ON AN OXISOL,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.

R. L. Parfitt.
Soil Science Socity of America Journal, Vol. 41, No. 6, p 1064-1067, November-December, 1977. 1 fig, 1 tab, 22 ref.

Descriptors: *Adsorption, *Phosphates, Soil chemistry, Soil properties, *Oxisol, Isotherms, *Irox oxides, *Aluminum hydroxide.

Adsorption isotherms for phosphate on the A and B horizon of an oxisol from Papua New Guinea showed high affinity adsorption at low solution concentrations and a linear increase in adsorption at higher solution concentrations. Adsorption increased with decrease in pH in the range 3 to 8. Comparison with data obtained under similar conditions with synthetic goethite (alpha-FeOOH) and gibbsite (Al(OH)3) suggested that phosphate reacted with FeOH and FeOH2+ groups on soil iron oxide surfaces to form a binuclear bridging FeOP(O2)OFe complex and with exposed Al(OH)H2O on Kaolinite edges and on hydroxy-aluminum species to form a binuclear or bidentate phosphate complex. At higher phosphate concentrations isotherms showed continued adsorption which may be due to a further reaction involving hydroxy-aluminum groups. (Skogerboe-Colorado State)
W78-08908

APPLICATIONS AND MISAPPLICATIONS OF THE LANGMUIR EQUATION TO SOIL ADSORPTION PHENOMENA,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter, and D. E. Baker.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1077-1080, November-December, 1977. 2 fig, 2 tab, 12 ref.

Descriptors: *Adsorption, Soils, Soil investigations, Soil properties, *Soil chemistry, Isotherms, *Langmuir equation, Equations.

When the development of the Langmuir adsorption equation is critically examined, it is evident that the equation soil scientists have been using (C/x/m = C/k + 1/kb, where C is concentration of adsorbate, x/m is the amount adsorbed per unit weight adsorbent, k is the adsorption maximum, and b is a constant) is in the wrong form. This error is of no great importance when the equation is merely used to obtain a calculated adsorption maximum for comparison to other adsorbent properties. However, it does become important when attempts are made to understand adsorption dynamics and bonding strengths. The commonly reported curvilinear nature of the C/x/m vs. C plots is simply the result of not considering the effect of desorbed ions in the equilibrium solution, rather than being due to multiple adsorption mechanisms. When the equation is corrected by considering desorbed ions, the isotherm becomes linear. In addition, the constant, b, of the Langmuir equation is not simply related to the bonding energy of the adsorbed ion, but to the ratio of adsorbed and desorbed ion bonding energies. (Skogerboe-Colorado State)
W78-08909

AMMONIA VOLATILIZATION FROM SOILS: EQUILIBRIUM CONSIDERATIONS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Engineering.
Y. Avnimelech, and M. Laher.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1080-1084, November-December, 1977. 2 fig, 1 tab, 9 ref.

Descriptors: *Ammonium, Soils, *Soil chemistry, Soil properties, *Fertilizers, Nutrients, *Buffer capacity(Soils), Volitilization.

The volatilization of ammonia from soils as a function of the system's properties is analyzed theoretically and experimentally. The final concentration of ammonium held by the soil increases with an increase in hydrogen ion activity, with the initial ammonium concentration, and with partial pressure of ammonia in the air. An increase in the buffer capacity of the soil leads to a decrease in the final ammonium concentration. A good agreement has been found between measured and computed values for NH3 and NH4 concentrations during the process. The pH of the soil is the dominant factor controlling the extent of ammonia volatilization only when the soil's buffer capacity is high, or, when the concentration of ammonium in the soil is low. At high pH and high initial ammonium concentrations, the dominant factor controlling the reaction is the buffer capacity of the soil. (Skogerboe-Colorado State)
W78-08910

ORGANIC PHOSPHATE TRANSPORT AND HYDROLYSIS IN SOIL: THEORETICAL AND EXPERIMENTAL EVALUATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5B.
W78-08911

WATER MOVEMENT AND INFILTRATION IN A FROZEN SOIL: THEORETICAL AND EXPERIMENTAL CONSIDERATIONS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
T. S. Steenhuis, G. D. Bubenzer, and M. F. Walter.
Paper No. 77-2545. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois, 31 p, 8 fig, 2 tab, 20 ref, 2 append.

Descriptors: Soil water, *Soil water movement, *Infiltration, Soils, Soil properties, Temperature, Soil temperature, *Frozen soils.

Water movement in a frozen soil was compared theoretically and experimentally with a non-frozen soil. During the winter, water movement was upwards to the surface. Infiltration of water was only possible when the soil temperature was at freezing point, but not below, or when the soil contained macropores. (Skogerboe-Colorado State).
W78-08912

INFILTRATION EQUATION: DERIVATION TO INCLUDE SURFACE EFFECTS,
Missouri Univ. -Columbia. Dept. of Agricultural Engineering.
J. M. Gregory, H. P. Johnson, and D. Kirkham.
Paper No. 77-2552. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December, 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 31 p, 4 fig, 2 tab, 15 ref.

Descriptors: *Infiltration, *Equations, Model studies, Soil water, *Soil water movement.

An Infiltration equation capable of modeling changing surface conditions has been derived by use of the energy equation. This equation has the surface effects grouped in one function which can be separated from other variables affecting infiltration. When the surface term is set equal to zero, the equation reduces to the same form as the Green-Ampt equation. (Skogerboe-Colorado State).
W78-08913

APPLICATION OF AN INFILTROMETER SYSTEM FOR DESCRIBING INFILTRATION INTO SOILS,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
D. L. Brakensiek, W. J. Rawls, and W. R. Hamon.
Paper No. 77-2553. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 14 p, 7 fig, 4 tab, 24 ref.

Descriptors: *Infiltration, Soil water, *Soil water movement, Model studies, Equations, *Infiltrometer systems.

The design and operation of an infiltrometer systems is discussed. The analysis of the infiltrometer data is illustrated by estimation of the parameters in the Green and Ampt infiltration equation. The Green and Ampt equation seems to model the observed point infiltration process very well. Future needs in infiltrometer studies are presented. (Skogerboe-Colorado State)
W78-08914

FINITE ELEMENT MODELING OF UNSATURATED FLOW,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
G. L. Bloomsburg, and R. A. Bloomfield.
Paper No. 77-2555. Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois, 21 p, 7 fig, 3 tab, 5 ref.

Descriptors: *Simulation analysis, *Unsaturated flow, Mining, *Infiltration, Rainfall, Evaporation, *Model studies, Soil water movement, Soil water, *Finite element analysis, *Computer programs.

This report concerns the use of a finite element computer program to simulate unsaturated flow through retorted oil shale piles under various conditions of ponding, infiltration due to rainfall, and evaporation. Field data from seepage ponds constructed in waste shale near Rifle, Colorado, are compared with data from computer simulation. (Skogerboe-Colorado State)
W78-08915

COLORIMETRIC DETERMINATIONS OF EXCHANGEABLE AMMONIUM, UREA, NITRATE, AND NITRITE IN A SINGLE SOIL EXTRACT,
Texas A and M Univ., Lubbock. Agricultural Research and Extensions Center.
A. B. Onken, and H. D. Sunderman.
Agronomy Journal, Vol. 69, No. 1, p 49-53, January-February 1977. 10 tab, 9 ref.

Descriptors: *Ammonium, *Urea, *Nitrates, *Nitrites, Fertilizers, Soils, Soil investigations, Soil tests.

Interest in N transformations in soils has increased greatly in recent years, particularly with increased use of urea-containing fertilizers. However, only one procedure for determination of exchangeable ammonium, nitrate, nitrite, and urea in a single soil extract has een proposed and it requires the use of both distillation and colorimetric equipment. It would be useful to have a set of colorimetric procedures for the determination of these N forms in a single extract. Previous research indicated sodium sulfate, as an extractant, would be least likely to produce unwanted interferences in these procedures. Thus, research was initiated to determine (1) if Na2SO4 could br used as an extractant for exchangeable NH4+, NO3-, NO2- and urea and (2) necessary modifications to make desirable colorimetric procedures usable in a Na2SO4 extraction system. (Skogerboe-Colorado State)
W78-08924

A TWO-DIMENSIONAL LINEARIZED VIEW OF ONE-DIMENSIONAL UNSATURATED-SATURATED FLOW,
Iowa State Univ., Ames. Dept. of Agronomy.
J. Cushman, and D. Kirkham.
Water Resources Research, Vol. 14, No. 2, p 319-323, April 1978. 4 fig, 16 ref.

Descriptors: *Saturated flow, *Unsaturated flow, *Mathematical models, *Numerical analysis, Equations, Finite element analysis, Infiltration, Moisture content, Pressure head, Theoretical analysis, Two-dimensional flow.

A numerical analysis of the one-dimensional, unsaturated-saturated flow problem was presented. Both the pressure head and moisture content equations were studied for vertical and horizontal infiltration, respectively. The problems were considered in a two-dimensional setting in which time was considered the second dimension. The numerical scheme used was finite element analysis coupled with a simple linearizing assumption. The numerical process was compared with various other analytic and numerical solutions of the same problems. It was shown that if the size of the elements is not too large, the method is very accurate. (Visocky-ISWS)
W78-09040

DISCHARGE-DEPTH EQUATION FOR SHALLOW FLOW,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-09045

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-09049

SOIL CONDITIONS, ZONATION AND SPECIES DIVERSITY IN A SEASONALLY FLOODED TROPICAL GRASS-HERB SWAMP IN SIERRA LEONE,
Fourah Bay Coll., Freetown (Sierra Leone). Botany Dept.
For primary bibliographic entry see Field 2I.
W78-09083

A DEVICE FOR THE IRRIGATION OF SOIL COLUMNS (IN GERMAN),
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldernaehrung.
F. Beese, C. Heuer, and W. Rodewald.
Z Pflanzenernaehr Bodenkd Vol 5, p 581-587, 1976.

Descriptors: *Sprinkler irrigation, Irrigation systems, Irrigation, Control, Flow control, Soil moisture.

An irrigation device was designed for maintaining a constant water flow in soil columns over a long period of time. The apparatus consists of 3 construction elements: a balance for the dosage of the water, a sprinkler to distribute the water on the soil surface and an electronic time control to adjust different time steps. The wide range of possible rain intensities is shown. The mean variation of the water pulses and their distribution over the surface are discussed. The apparatus produced good results in long duration experiments.--Copyright 1977, Biological Abstracts, Inc.
W78-09109

FLOW FROM A LINE SOURCE ABOVE A SHALLOW WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W78-09112

THE SHEAR RESISTANCE OF ROOT-PERMEATED HOMOGENEOUS AND STRATIFIED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
L. J. Waldron.
Soil Science Society of America Journal, Vol. 41, No. 5, p 843-849, September-October, 1977. 8 fig, 3 tab, 17 ref.

Descriptors: Soils, *Soil investigations, *Root systems, Root development, Root distribution, Cohesion, Alfalfa, Barley, Model studies, Clays, *Shear(Soils), Soil compaction, *Slope stability.

Mechanical reinforcement which stabilizes soil on slopes has been attributed to plant roots. To measure such reinforcement, direct shear tests were made on 25-cm diameter root-permeated soil columns. Roots of alfalfa, barley, and yellow pine, each increased the shear resistance of homogeneous and compacted layers of silty clay loam at 30-cm depth. One-year-old alfalfa had a much greater reinforcing effect than pine trees 16 months after transplanting or barley at its maximum growth. Barley had a greater effect in the clay loam than pine, but its effectiveness decreased as depth increased from 15 to 30-45 cm. Alfalfa roots were more effective than either pine or barley roots in increasing the resistance to shearing between a dense gravel-sand layer (simulating weathered rock) and the overlying soil, increasing shearing resistance to as much as 5 times that of fallow soil. A model is presented of soil reinforced by nonrigid roots. Calculations are given of slope safety factor increases from root reinforcement. (Skogerboe-Colorado State)
W78-09113

TRACING THE TRANSFORMATIONS OF UREA FERTILIZER DURING LEACHING,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
R. J. Wagenet, J. W. Biggar, and D. R. Nielsen.
Soil Science Society of America Journal, Vol. 41, No. 5, p 896-902, September-October, 1977. 8 fig, 5 tab, 22 ref.

Descriptors: *Urea, *Fertilizers, Fertilization, Nutrients, *Leaching, Soils, Soil investigations, Mathematical studies, Kinetics, Model studies, *Nitrification, *Denitrification, Nitrates, Nitrogen, Ammonia, Ion transport.

The transport and transformation of urea, NH(4+), and NO(3-) in soil were mathematically described as functions of depth and time, subject to either steady feed or pulse application of N, using relationships derived by assuming diffusion and mass transfer as transport processes and first-order kinetics as a transformational mechanism. The mathematical model was used to study the enzymatic hydrolysis of urea, nitrification, and denitrification in laboratory soil columns. Urea hydrolysis was independent of initial urea concentration and the 02 concentration of the soil atmosphere. The rate of nitrification under transient N conditions was one order of magnitude greater than the rate of denitrification when there was 20% O2 in the soil atmosphere. Populations of nitrifiers increase in response to successive applications of N. (Skogerboe-Colorado State)
W78-09114

PORTLAND CEMENT AS A SOIL AMENDMENT FOR CORN AND SOYBEANS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-09118

FACTORS AFFECTING WATER DISTRIBUTION AFTER UNIFORM IRRIGATION,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
G. Sinai, and D. Zaslavsky.
Paper No. 77-2573 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13,16, 1977, Chicago, Illinois, 29 p, 12 fig, 19 ref.

Descriptors: Irrigation, *Irrigation water, *Soil moisture, Soil water, *Soil water movement, Hydraulic conductivity, Irrigation effects, *Infitration, Distribution systems.

Uniformly distributed irrigation water could infiltrate laterally so that the spatial variability in moisture in the root zone would be very high. This was observed in field experiments and was proved theoretically. A suggested explanation was lateral flow in the soil due to anisotropy in its conductivity. Most cultivated layers are anisotropic so lateral flow could occur in fields. (Skogerboe-Colorado State)
W78-09130

BENEFITS OF SURFACE DRAINAGE,
Arkansas Cooperative Extension Service, Little Rock.
For primary bibliographic entry see Field 4A.
W78-09133

SOIL THERMAL DIFFUSIVITY DETERMINATION FROM OVERSPECIFICATION OF BOUNDARY DATA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
S. R. Singh, and B. K. Sinha.
Soil Science Society of America Journal, Vol 41, No 5, p 831-834, September-October 1977. 1 fig, 1 tab, 18 ref.

Descriptors: Heat, Diffusivity, Soils, *Soil investigations, *Soil temperature, Soil profiles, Mathematical studies, *Thermal diffusivity(Soils).

The heat conduction equation has been solved for evaluating thermal diffusivity of soils by overspecifying the usual boundary conditions in terms of the thermal gradient at the boundary surface. Solutions have been obtained for different Dirichlet-type boundary conditions describing the boundary temperature. These were (a) linearly rising/falling, (b) exponentially rising, (c) exponentially falling, and (d) sinusoidal. The thermal gradient in the soil profile was evaluated using a cubic spline. Field data were analyzed firstly by representing the surface temperature as linearly rising and secondly as sinusoidal. More consistent results were obtained with the help of the first approximation which represented the boundary data closely. This shows that a close approximation of boundary condition by an appropriate function is essential to get reliable values of the thermal diffusivity. (Skogerboe-Colorado State)
W78-09137

IRRIGATION SCHEDULING WITH NEUTRON PROBE,
Bureau of Reclamation, Boulder City, NV.
For primary bibliographic entry see Field 3F.
W78-09139

ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE. VOLUME 1: TREND IDENTIFICATION AND EVALUATION,
Development Planning and Research Associates, Inc., Manhattan, KS.
S. G. Unger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 233, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-121, October, 1977. 188 p, 37 fig, 32 tab, 55 ref, 1 append.

Descriptors: *Agriculture, *Silviculture, *Environmental effects, Environmental quality, Management.

Current and emerging trends in United States agriculture and silviculture that will have the most significant environmental implications in both the short term (1985) and the long term (2010) are determined and assessed. Five major subsectors of agriculture and silviculture were included in the analysis: (1) nonirrigated crop production, (2) irrigated crop production, (3) feedlot production, (4) range and pasture management, (5) silviculture

and harvest management. Within each subsector, numerous trends and developments were identified and defined. Thereafter, an evaluation workshop, comprised of professionals from throughout the nation, evaluated, rated and rank-ordered the most significant environmentally related trends. (Skogerboe-Colorado State)
W78-09149

AGRONOMY ABSTRACTS, 1977 ANNUAL MEETINGS.
American Society of Agronomy, Madison, WI.
For primary bibliographic entry see Field 3F.
W78-09150

A TENSIOMETRIC CONTROL DEVICE FOR AUTOMATIC IRRIGATION (IN SLOVANIA),
For primary bibliographic entry see Field 3F.
W78-09158

MODEL FOR SIMULATING SOIL-WATER CONTENT CONSIDERING EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources and California Univ., Davis. Dept. of Civil Engineering.
A. Afshar, and M. A. Marino.
Journal of Hydrology, Vol. 37, No. 3/4, p 309-322, May 1978. 8 fig, 15 ref. CSRS CA-D-WSE-3081-H, CA-D-WSE-3479-H.

Descriptors: *Evapotranspiration, *Model studies, *Soil-water plant relationships, Mathematical models, Profiles, Equations, Rainfall, Root zone, Irrigation, Evaporation, Digital computer, *Soil-water content, *Transient field conditions.

A mathematical model was developed to predict the soil water content profile under transient field conditions. The model takes into account a variable transpiration rate and a nonuniform initial soil water content. Rainfall, irrigation, and evaporation were treated as sources of nonuniform potential surface flux. The possibility of no flux at the soil surface also was included in the model. Solutions to the model were obtained numerically by a finite-difference scheme involving predictor-corrector equations. The scheme resulted in a tridiagonal set of simultaneous equations which could be solved rapidly in a digital computer. A step-by-step description of the computational procedure was included. Application of the model to some field conditions and comparison of the results with field measured data showed very good agreement. Sensitivity of the model to changes in rooting zone, root density function, and depth to the bottom boundary also was analyzed. (Roberts-ISWS)
W78-09206

TUBE DRAINAGE IN STRATIFIED SOIL ABOVE AN AQUIFER,
Iran Coll. of Science and Technology, Teheran.
For primary bibliographic entry see Field 4A.
W78-09211

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
1976, 266 p.

Descriptors: *Research and development, *Soil science, *Water resources development, *Air, Crop production, Farm management, Environment, Environmental effects, Agriculture, Protection, Public health, Effects, Efficiencies, Sediment control, Soil management, Land reclamation, Water pollution, Cultivation, Revegetation, Pollutants, Air pollution, *Environmental quality, Animal health, Solar energy.

Soil, Water and Air resources are of primary concern to the Agricultural Research Service. Research is aimed toward development of cultural practices and cropping systems that assure efficient use of these resources while, at the same time, providing adequate protection for sustained use. In many cases, technology developed is also applicable to enhancing environmental quality for nonagricultural purposes. The reported research deals with many aspects of the husbandry of these vital resources. This research program covers a wide range within the environment, from the hydraulics of flow in irrigation conveyances or natural streams to the relationships among soil properties, efficient production of high quality crops, and the effect of these on animal or human health. The purpose of this report, however, was to provide for those interested in the fruits of this work, a brief overview of the scope of the activities and examples of recent findings, some of which still have not been released by prior publication. No attempt was made at completeness. The research highlights were identified by location and a map of research stations. (See also W77-10917) (Froehlich-ISWS)
W78-09213

AIR-EARTH INTERFACE CONCEPT FOR WIDE-RANGE CONTROL OF INFILTRATION,
Agricultural Research Service, AZ. Southwest Rangeland Watershed Research Center.
R. M. Dixon.
Paper No. 77-2062 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 33 p, 11 fig, 1 tab, 28 ref.

Descriptors: *Infiltration, *Soil water movement, Simulation analysis, Soils, Soil investigations, *Air-earth interfaces.

The air-earth interface concept is formulated and discussed relative to experimental verification, compatibility with Darcy-based infiltration theory, quantification for predictive purposes, and applicability to practical infiltration control problems. This concept appears applicable to cultivated and uncultivated soils, and to soils severely disturbed by road construction and strip mining. (Skogerboe-Colorado State)
W78-09261

A CONTINUOUS WATER BUDGET MODEL FOR WESTERN KANSAS,
Agricultural Research Service, Lafayette, IN.
W. H. Neibling, J. K. Koelliker, and F. E. Ohmes.
Paper No. 77-2056 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 17 p, 5 fig. 3 tab, 22 ref.

Descriptors: *Kansas, *Model studies, *Evapotranspiration, *Soil moisture, Soil water, *Soil profiles, Climate, *Hydrologic budget.

A continuous water-budget model was developed and calibrated for use in western Kansas. Daily potential evapotranspiration (PET), actual ET, and soil moisture changes in a 213 cm soil profile were calculated from inputs of crop and soil moisture characteristics and daily meteorological observations. (Skogerboe-Colorado State)
W78-09263

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Agricultural Research Service, Temple, TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W78-09264

MODELING INFILTRATION DURING A VARIABLE RAIN,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Paper No. 77-2063, Presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 14 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Model studies, *Infiltration, Rainfall intensity, Rainfall-runoff relationships, Equation, *Green Ampt equation.

The Green Ampt equation was modified to describe the infiltration process during a rainfall event with variable intensities. A procedure was introduced to determine the volume of runoff and the distribution of rainfall excess. (Skogerboe-Colorado State)
W78-09271

2H. Lakes

A MODEL TO DESCRIBE THE INHERENT SPATIAL AND TEMPORAL VARIABILITY OF PARAMETERS IN LAKE ONTARIO 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
A. H. El-Shaarawi, and R. E. Kwiatkowski.
Journal of Great Lakes Research, Vol. 3, No. 3-4, p 177-183, December 1977. 3 fig, 3 tab, 14 ref.

Descriptors: *Lake Ontario, *Statistical models, *Limnology, *Lakes, *Water quality, Sampling, Model studies, Mathematical models, Carbon, Water temperature, Chlorophyll, Seasonal, Secchi disks, Variability, On-site investigations, On-site tests, Optical properties, Nitrogen, On-site data collections, Spatial variability, Temporal variability.

A statistical model was developed to evaluate the temporal and spatial variability inherent in limnological sampling of large lakes. The model was applied to Secchi disc, transmissometer readings, temperature, integrated total particulate carbon, integrated total particulate nitrogen, and integrated chlorophyll a. The data were obtained during the 15 Lake Ontario surveillance cruises conducted between April - December, 1974. Based on the model, Lake Ontario was classified into a set of 7 statistical zones for each parameter. An estimate of the seasonal cycle for each parameter also was obtained. It was found that the seasonal variability was more pronounced than the spatial variability for all parameters analyzed. However, a significant horizontal variability did exist, and this variability must be recognized in future modelling efforts. (Humphreys-ISWS)
W78-08817

ANTHROPOGENIC PARTICLES IN THE SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-08820

SEDIMENTATION RATES IN LAKE HURON AND GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-08821

SURFICIAL SEDIMENT REDISTRIBUTION BY WAVE ENERGY: ELEMENT-GRAIN SIZE RELATIONSHIPS,
Michigan Univ. Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2J.
W78-08822

PRECIPITATION INPUTS OF PCBS TO LAKE MICHIGAN,
Paul Univ., Chicago, IL. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.

W78-08823

INTERNAL KELVIN WAVES IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin.
Journal of Geophysical Research, Vol. 83, No. C5, p 2409-2418, May 20, 1978. 6 fig, 1 tab, 11 ref.

Descriptors: *Internal waves, *Lakes, *Fjords, *Canada, On-site investigations, On-site data collections, Model studies, Mathematical models, Circulation, Water circulation, Currents(Water), Velocity, Winds, Stratification, Limnology, *Kamloops Lake(British Columbia).

It was argued theoretically that internal oscillations in a fjord lake have a three-dimensional nature during the stratified period. A dynamical model was proposed that is based on the approximation that for Kelvin waves, the component of flow parallel to the isobaths is much larger than the normal component. A general method of solution of the model equations was outlined which takes into account the details of the shoreline configuration, bathymetry, and density structure and was applied to the long-period oscillations of the thermal structure of Kamloops Lake. Six episodes of internal seiches of the first vertical and longitudinal mode were examined during the period from May to November. Numerical computations predicted that periods range from 33 to 140 hours and that the largest isotherm displacements occur in the region of slower phase speed in the western portion of the lake. These findings were confirmed both by visual inspection and by spectral analysis of the isotherm displacements at three locations in the lake and by wind records. The unusual characteristics of the thermal structure in the lake were shown to exert a stabilizing influence on large-amplitude wave disturbances. Long-period internal waves were generated primarily by suddenly imposed and vigorous wind forcing along the axis of the lake. (Sims-ISWS)
W78-08832

TROPHIC CONDITIONS IN LAKE WINNISQUAM, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-08842

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

REPORT FOR THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT, OF THE SENATE COMMERCE COMMITTEE HEARING ON MERCURY CONTAMINATION UNDER THE DIRECTION OF SENATOR PHILLIP A. HART, AT MT. CLEMENS.
Federal Water Quality Administration, Chicago, IL. Great Lakes Region.
For primary bibliographic entry see Field 5G.

W78-08993

DYNAMICS OF RESERVOIR OF MEDIUM SIZE,
California Univ., Berkeley. Dept. of Civil Engineering.
J. Imberger, J. Patterson, B. Hebbert, and I. Loh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13773, p 725-743, May 1978. 5 fig, 22 ref, 2 append.

Descriptors: *Australia, *Reservoirs, *Water quality control, *Model studies, *Hypolimnion, Mixing, Simulation, Oceanography, Methodology, *Salinity, *Water temperature, Calibration, *Reservoir dynamics, *Lagrangian model, *Wellington reservoir.

A Lagrangian one-dimensional model of the dynamics of a reservoir was presented. The model utilizes new formulas to describe the dynamic of both the inflow and outflow. In addition, recent advances pioneered in the oceanographic literature were modified and applied to the dynamics of the mixed layer. Finally, a new model was proposed for deep hypolimnionic mixing. The model so constructed contains only four universal constants. Data from one complete annual cycle of the salinity and temperature distribution from a Western Australian reservoir were used to calibrate the model. (Singh-ISWS)
W78-09031

EVALUATION OF EVAPORATION FROM LAKE ONTARIO DURING IFYGL BY A MODIFIED MASS TRANSFER EQUATION,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Marine Applications Div.
For primary bibliographic entry see Field 2D.
W78-09039

TIME-DEPENDENT RESPONSE OF A LARGE VARIABLE DEPTH BASIN TO A SUDDENLY IMPOSED WIND STRESS,
Princeton Univ., NJ. Dept. of Geological Sciences; and Princeton Univ., NJ. Dept. of Engineering Sciences.
G. E. Birchfield, and B. P. Hickie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 897, Price codes: A02 in paper copy, A01 in microfiche. Series in Applied Mathematics, Report No. 75-7, October 1975. 20 p, 2 tab, 9 ref, 1 append. NSF GA-25992,NOAA 04-4-022-37.

Descriptors: *Lakes, *Winds, *Waves(Water), Model studies, Mathematical models, Equations, Water bodies, Depth, Topography, Mixing, Turbulence, Water circulation, Limnology.

The time dependent response of a large barotropic basin of variable depth to a suddenly imposed wind stress was investigated. Bottom stress was neglected. The relative roles of gravity and topographic waves were investigated. The response can be described as made up of a fast response consisting of a pseudo-static wind setup and the lowest mode seiche, a slow response consisting of coastal jets moving in the direction of the wind stress, and a broad slow return flow in the interior. Both topographic and gravity waves contribute to the first response, while only topographic waves contribute to the second. (Sims-ISWS)
W78-09056

A NOTE ON THE CONCEPTS OF AGE DISTRIBUTION AND TRANSIT TIME IN NATURAL RESERVOIRS,
Stockholm Univ. (Sweden), Dept. of Meteorology.
A. Bjorkstram.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-31811, Price codes: A02 in paper copy, A01 in microfiche. Report AC-35, April 1976. 10 p, 2 fig, 2 ref.

Descriptors: *Reservoirs, *Lakes, *Time, Mass transfer, Input-output analysis, Travel time, Age, Statistics, Analytical techniques, Limnology, Transit time, Residence time.

A general relation between the average age and the residence time distribution of material in a reservoir at steady-state was derived. Given the average residence time, it was shown that the average age increases with increasing standard deviation in the residence time distribution. (Sims-ISWS)
W78-09057

SOIL CONDITIONS, ZONATION AND SPECIES DIVERSITY IN A SEASONALLY FLOODED TROPICAL GRASS-HERB SWAMP IN SIERRA LEONE,
Fourah Bay Coll., Freetown (Sierra Leone). Botany Dept.
For primary bibliographic entry see Field 2I.
W78-09083

MAPPING WETLANDS ON BEAVER FLOWAGES WITH 35 MM PHOTOGRAPHY,
Southern Illinois Univ., Carbondale. Cooperative Wildlife Research Lab.
For primary bibliographic entry see Field 7C.
W78-09087

AN UNUSUAL BLACK GUM SWAMP IN MAINE,
Vermont Univ., Burlington. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-09092

SEASONAL CHANGES IN STANDING CROP AND PRIMARY PRODUCTION IN A SEDGE WETLAND AND AN ADJACENT DRY OLD-FIELD IN CENTRAL MINNESOTA,
Ithaca Coll., NY. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-09094

BIOMASS AND PRODUCTIVITY OF AN ALDER SWAMP IN NORTHERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 2I.
W78-09097

SHORT-TERM PLANT SUCCESSIONS FOLLOWING THE COLONIZATION OF A NORTHERN SWEDISH LAKE BY THE MUSKRAT, ONDATRA ZIBETHICA,
Umea Univ. (Sweden). Dept. of Ecological Zoology.
For primary bibliographic entry see Field 2I.
W78-09100

DECOMPOSITION OF SALT MARSH GRASS, SPARTINA ALTERNIFLORA LOISEL,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 2I.
W78-09102

GRAVEL PITS AS NEW WETLAND HABITATS FOR THE CONSERVATION OF BREEDING BIRD COMMUNITIES,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 4C.
W78-09105

THE CRANESVILLE PINE SWAMP,
Maryland Univ., Solomons. Natural Resources Inst.

K. B. Fuller, and P. S. Frank, Jr.
Atlantic Naturalist, Vol 29, No 3, p 101-105, Autumn, 1974. 1 fig, 9 ref.

Descriptors: *Swamps, *Bogs, *Maryland, Lumbering, Wetlands, Coniferous trees, *Cranesville Pine Swamp(MD).

Cranesville Pine Swamp, a 560-acre swamp near Oakland, Maryland, is one of the few remaining boreal bogs in the southern states. Due to its elevation and peculiar topography the temperature within the swamp is lower than that of surrounding areas. Plant and animal life is typical of boreal regions; some species occurring here are at the southernmost extent of their ranges. Logging during the late 1800's lead to the construction of a railway into the swamp. Since that period, logging has been infrequent and of a modest scale. The Nature Conservancy purchased 259 acres of the swamp and Cranes Swamp Nature Sanctuary was established. An additional 38 acres have been acquired, and eventual acquistition of the remaining acreage is planned. The U.S. Department of the Interior has designated the area a natural history landmark. (Stihler-Mass)
W78-09107

PRELIMINARY STUDIES ON CHITIN DECOMPOSITION IN LAKE ERIE SEDIMENTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-09152

1977 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Ministry of Agriculture, Atrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5C.
W78-09153

PREIMPOUNDMENT AND IMMEDIATE POST IMPOUNDMENT ADENOSINE TRIPHOSPHATE CONCENTRATIONS IN SOUTHERN INDIAN LAKE: 1975, 1976,
Fisheries and Marine Servie, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5A.
W78-09161

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-09164

PHYTOPLANKTON SPECIES, BIOMASS, AND DIVERSITY IN LAKE LA CALDERA (SIERRA NEVADA, GRANADA, SPAIN),
Granada Univ. (Spain). Dept. of Ecology.
For primary bibliographic entry see Field 5C.
W78-09169

THE INTENSITY OF MULTIPLICATION OF BACTERIA AND BIOMASS PRODUCTION IN THE WATER OF TWO LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-09173

LAKE ERIE AIRPORT STUDY,
Howard, Needles, Tammen and Bergendoff, Cleveland, OH. Cleveland Aviation Office.
For primary bibliographic entry see Field 6G.
W78-09186

CONTRIUBITON TO A METHOD FOR CALCULATING THE EXPECTED MINERALIZATION OF RESERVOIR WATER,
M. I. Kriventsov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 417, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 609, March 1977. 17 p, 1 fig, 4 tab, 8 ref. Translated from Gidroteknika i Meloratsiya, No. 8, p 52-63, 1953.

Descriptors: *Reservoirs, *Salts, *Water chemistry, Model studies, Mathematical models, Equations, Lakes, Water pollution, Water quality, Ground water, Evaporation, Runoff, Discharge(Water), Ice, Lake ice, Mineralization, Minerals.

The mineralization of reservoir water was calculated by a formula derived from the equations of water and salt balance of a reservoir or lake. This formal was discussed. (Sims-ISWS)
W78-09221

DATA ANALYSIS AND MODEL DEVELOPMENT FOR ECOSYSTEM MANAGEMENT AT LAKE GEORGE, N.Y.,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Electrical and Systems Engineering.
For primary bibliographic entry see Field 5C.
W78-09243

2I. Water In Plants

FIELD-MEASURED WATER UPTAKE OF SUDANGRASS ROOTS AS AFFECTED BY FERTILIZATION,
California Univ., Riverside.
For primary bibliographic entry see Field 3F.
W78-08926

METABOLISM OF ORGANOPHOSPHORUS COMPOUNDS IN SOYBEAN PLANTS IN FLOODED SOIL (IN RUSSIAN),
Far Eastern Univ., Vladivostok (USSR).
E. A. Belyavskaya, and V. E. Kosmakova.
S-Kh Biol 12(3), p 419-423, 1977.

Descriptors: Soil moisture, *Organophosphorus compounds, *Flooding, *Soybeans, *Phosphorus compounds, *Metabolism, *Nucleic acids.

The effect of flooding (1-7 days) on the content of nucleic acids and P compounds of the acid-soluble fraction in soybean plants was studied. Young leaves showed an increase of nucleic acids and other phosphor-organic compounds and were more active in the responsive metabolically adaptive reaction.--Copyright 1978, Biological Abstracts, Inc.
W78-08966

MISSISSIPPI FLORA. I MONOCOTYLEDON FAMILIES WITH AQUATIC OR WETLAND SPECIES,
Georgia Univ., Athens. Dept. of Botany.
S. B. Jones, Jr.
Gulf Research Reports, Vol. 4, No. 3, p 357-379. December, 1974. 7 fig, 28 ref.

Descriptors: *Aquatic plants, *Mississippi, *Monocota, Wetlands, Rooted aquatic plants, Ecological distribution, Aquatic habitats, Gulf Coastal Plain.

Keys, distribution maps, habitats, references, nonmenclature, and notes are given for some 16 families of monocotyledons occurring naturally or naturalized in Mississippi. These familites all contain one or more species which are found in aquatic or wetland habitats. They are: Alismataceae, Araceae, Cannaceae, Haemodoraceae, Hydrocharitaceae, Juncaginanceae, Lemnaceae, Marantaceae, Mayacaceae, Najadaceae, Ponterderiaceae, Potamogetonaceae, Ruppiaceae, Sparganiaceae, Typhaceae, Zannichelliaceae. (Stihler-Mass)
W78-09078

PRIMARY PRODUCTIVITY OF COASTAL MARSHES IN MISSISSIPPI,
Mississippi State Univ., Mississippi State, Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-09079

AQUATIC WEEDS - ERADICATE OR CULTIVATE,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 4A.
W78-09080

PRODUCTIVITY RELATIONS IN A CAREX-DOMINATED ECOSYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
A. N. D. Auclair, A. Bouchard, and J. Pajaczkowski.
Oecologia, Vol. 26, No. 1, p 9-31. 1976. 12 fig, 2 tab, 69 ref.

Descriptors: *Primary productivity, *Standing crops, *Wetlands, Productivity, Ecosystems, Seasonal, Fertility, Soil properties, Nutrients, Burning, Cattails, Sedges, *Carex.

Seasonal and total primary productivity were measured for a Carex meadow in southern Quebec, Canada. Forty-five quadrats were sampled for dry weight biomass, species composition, structure (species density, diversity, height) and soil parameters. For a 130-day growth period, mean shoot net productivity was 6.3 g/sq m/day and terminal standing crop was 807 g/sq m. Terminal standing crop was very close to total litter mass (779 g/sq m) with peak productivities in mid-June (15.3 g/sq m/day) and mid-July (4.3 g/sq m/day). Decomposition of the previous year's litter was 81% complete by late September. The three most significant gradients resolved by principal components analysis were soil fertility, fire incidence, and topographic position, in that order of importance. The soil fertility component distinguished sediment-rich Typha angustifolia communities near open water from oligotrophic stands of Carex spp. on central areas of the meadow. Patterns of N, P, K, and Ca distribution coincided closely with total shoot production and litter mass levels suggesting closed biotic cycles of these elements. A model accounting for species diversity levels in a Carex marsh was formulated based on the assumption that high productivity results in competitive species elimination. (Stihler-Mass)
W78-09081

NITROGEN FIXATION IN A SALT MARSH,
Lancaster Univ., Bailriggs (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09082

SOIL CONDITIONS, ZONATION AND SPECIES DIVERSITY IN A SEASONALLY FLOODED TROPICAL GRASS-HERB SWAMP IN SIERRA LEONE,
Fourah Bay Coll., Freetown (Sierra Leone). Botany Dept.
N. H. A. Cole.
Journal of Ecology, Vol. 61, No. 3, p 831-847, November, 1973. 5 fig, 3 tab, 13 ref.

Descriptors: *Swamps, *Vegetation, *Soil moisture, *Seasonal, *Tropical regions, Grasses, Wetlands, Hydrogen ion concentration, Moisutre deficit, *Dominant organisms, *Limiting factors,

*Vegetation zonation, *Sierra Leone, Species diversity, Grassnherb swamp.

Five vegetation zones were distinguished in a tropical grass-herb swamp. The different zones showed characteristic seasonal trends in soil moisture, pH and water-table depths, related to flooding in the wet season and dessication in the dry season. The summation of the duration of these two adverse extremes of soil moisture was used to express the unsuitability of the habitats for plant growth; this factor was inversely related to the species diversity. The 'habitat unsuitability' also altered the normal continuous growing season of the humid tropics. The inverse relationship between habitat unsuitability and the species diversity of the vegetation zone indicates that the lower grassy zones with a fairly short growing season tend towards single-species dominance with a few species having almost all the individuals. There were present wet season ephemerals, dry season therophytes, dormant herbaceous perennials and deciduous shrubs. The species diversity gradient of the vegetation zones throws light on the transition process from a community with single-species dominance to one with many species typical of the humid tropics, and departure from dominance to one with many species typical of the humid tropics, and departure from species-richness is a characteristic of habitats with adverse or limiting factors. (Maroncelli-Mass)
W78-09083

TIDAL IMMERSION OF SPARTINA MARSH AT BRIDGEWATER BAY, SOMERSET,
Nature Conservancy Roughmoor, Taunton (England).
For primary bibliographic entry see Field 2L.
W78-09084

NITROGEN FIXATION IN FLAX POND: A LONG ISLAND SALT MARSH,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09085

A FOUR YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESHWATER MARSH,
Smith Coll., Northampton, Mass. Dept. of the Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09086

AN UNUSUAL BLACK GUM SWAMP IN MAINE,
Vermont Univ., Burlington. Dept. of Botany.
H. W. Vogelman.
Rhodora, Vol. 78, No. 2, p 326-327, April, 1976.

Descriptors: *Swamps, *Maine, Wetlands, Deciduous trees, *Black gum trees.

A 5-acre hummocky swamp dominated by black gum (Nyssa sylvatica) is located in New Gloucester, Maine. The stand is, for all practical purposes, virgin. About 60 trees over 12 in. d.b.h. were counted; trunks of some trees are over 22-23 inches in diameter. Taller trees reach a height of 80-90 ft. Some trees could be in excess of 400 yr of age. The other vegetation of the swamp is also described. (Stihler-Mass)
W78-09092

SEASONAL CHANGES IN STANDING CROP AND PRIMARY PRODUCTION IN A SEDGE WETLAND AND AN ADJACENT DRY OLD-FIELD IN CENTRAL MINNESOTA,
Ithaca Coll., NY. Dept. of Biology.
J. M. Bernard.
Ecology, Vol. 55, No. 2, p 350-359, Early Spring, 1974. 2 fig, 2 tab, 42 ref.

Descriptors: *Primary productivity, *Standing crops, *Seasonal, Wetlands, *Minnesota, *Carex rostrata, *Sedges, Old fields.

Seasonal changes in above- and below-ground standing crop and primary production in a Carex rostrata wetland and an adjacent dry Poa pratensis old field were determined. Above ground, the sedge standing crop of green material varied from a minimum of 114 g/sq m frozen in the winter ice to a high of 852 g/sq m in late August. Maximum daily production averaged about 11 g/sq m/day from mid-June to mid-July. Below-ground standing crop was highest in winter at 328 g/sq m and declined to a low of 150 g/sq m in late July. Below-ground standing crop then increased at a rate averaging 1 g/sq m/day. The sedge wetland is about 325 g/sq m/yr more productive than the adjacent old field. (Stihler-Mass)
W78-09094

WINTER BIOMASS IN TYPHA GLAUCA GODR. AND SPARGANIUM EURYCARPUM ENGELM,
Ithaca Coll., NY. Dept. of Biology.
J. M. Bernard, and F. A. Bernard.
Bulletin of the Torrey Botanical Club, Vol. 100, No. 2, p 125-127, March-April, 1973. 1 tab, 11 ref.

Descriptors: *Biomass, *Winter, *Cattails, *Minnesota, Rhizmes, Wetlands, Rooted aquatic plants, *Productivity, *Shoots, *Bur-reed.

Winter biomass was determined for Typha glauca and Sparaganium eurycarpum in a central Minnesota wetland after all the current year's growth had died. Typha had 1040 g/sq m of living material of which 954 g/sq m were roots and rhizomes and 86 g/sq m were new shoots. The old shoots which had just died weighed 946 g/sq m. Sparganium had 682 g/sq m total living material consisting of 656 g/sq m roots and rhizomes and 26 g/sq m new shoots. The old dead shoots weighed 543 g/sq m. Annual below-ground rhizome production is estimated to be 371 g/sq m/year in Typha and 225 g/sq m/year in Sparganium. (Stihler-Mass)
W78-09095

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W78-09096

BIOMASS AND PRODUCTIVITY OF AN ALDER SWAMP IN NORTHERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Forestry.
G. R. Parker, and G. Schneider.
Canadian Journal of Forest Research, Vol. 5, No. 3, p 403-409, September, 1975. 6 tab, 11 ref.

Descriptors: *Biomass, *Primary productivity, *Swamps, Trees, *Michigan, Wetlands, Soil texture, Understory, Aboveground productivity, *Adler.

Total aboveground dry weight biomass and annual production were determined for two sites of different soil texture in an alder swamp of Michigan's upper peninsula. The more poorly drained site A averaged 5300 g/sq.m. and 640 g/sq.m. per year while the drier site B averaged 3100 g/sq.m. and 570 g/sq.m. per year. The smaller standing crop biomass on the better-drained site is due to greater abundance of Alnus rugosa. The tree stratum constitutes 97 and 93% of the total biomass and 84 and 80% of the total production on site A and B, respectively. The understory strata constituted the remaining 3 and 16% of the biomass and production of site A and 7 and 20% on site B. (Stihler-Mass)
W78-09097

SHORT-TERM PLANT SUCCESSIONS FOLLOWING THE COLONIZATION OF A NORTHERN SWEDISH LAKE BY THE MUSKRAT, ONDATRA ZIBETHICA,
Umea Univ. (Sweden). Dept. of Ecological Zoology.
K. Danell.
Journal of Applied Ecology, Vol 14, No 3, p 933-947, December, 1977. 9 fig, 2 tab, 44 ref.

Descriptors: *Succession, *Muskrats, *Vegetation, Wildlife, Wetlands, Rooted aquatic plants, *Sweden, Equisetum, Waterfowl, Lakes.

Short-term plant succession following miskrat colonization was studied in a Equisetum stand in a shallow lake in coastal northern Sweden. Vegetational changes were investigated using air photographs and belt transects in the field. Muskrat settlement resulted in a reduction of both Equisetum and Schoenoplectus and the creation of an area of open water around the house site. The area of open water was subsequently colonized by submerged hydrophytes. If the site was later abandoned by the muskrats for several years, or only utilized to a minor extent, Equisetum stands recovered, forcing the zone of submerged hydrophytes towards the center. A model of such short-term plant successions has been developed. When present in moderate densities, muskrats can have a beneficial effect in waterfowl management by maintaining open areas in otherwise over-dense vegetation. (Stihler-Mass)
W78-09100

DECOMPOSITION OF SALT MARSH GRASS, SPARTINA ALTERNIFLORA LOISEL,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
J. G. Gosselink, and C. J. Kirby.
Limnology and Oceanography, Vol 19, No 5, p 825-832, September, 1974. 3 fig, 2 tab, 26 ref.

Descriptors: *Salt marshes, *Microbial degradation, *Biomass, Degradation(Decomposition), Productivity, Marshes.

Studies on the decomposition of Spartina alterniflora indicate the presence of a microflora capable of rapid and efficient conversion of marsh grass into microbial biomass. Spartina alterniflora stems and leaves were ground, dried, separated into four size fractions from 67 to 213 microns average diameter, and incubated in the dark at 30 degrees C in inoculated artificial seawater: particulate nitrogen, oxidizable carbon, dry weight, and metabolic rate were followed for 30 days. Conversion efficiency of substrate particle size increased. (Stihler-Mass)
W78-09102

TROPHIC RELATIONSHIPS IN A SEAGRASS COMMUNITY (THALASSIA TESTUDINUM), IN CARD SOUND, FLORIDA. FISH DIETS IN RELATION TO MACROBENTHIC AND CRYPTIC FAUNAL ABUNDANCE,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
I. M. Brook.
Transactions of the American Fisheries Society, Vol 106, No 3, p 219-229, 1977. 1 fig, 4 tab, 38 ref.

Descriptors: *Fish diets, *Food chains, *Biomass, Benthos, Macrobenthos, Trophic level, *Mollusks, Killfish, Invertebrates, Predators, *Florida, Gulf of Mexico, *Seagrass, *Faunal abundance, Foragers, Primary consumers, *Card Sound(Fla).

The marine spermatophyte Thalassia testudinum is the dominant species in the seagrass community of the marine wetland systems of southeast Florida and the Florida Gulf coast. The trophic interaction between the fishes and the macrobenthic and cryptic fauna found in this area was examined. Based on digestive tract analysis, the principal in-

teraction between the primary consumers of the study area and the higher trophic level predators was via the polychaetes and peracaridean crustaceans. The mollusks which contributed significantly to the benthic biomass were not a preferred food for the animals frequenting the study site. The maximum mollusk biomass in any benthic and cryptic sample was 2.31 g dry/ sq. m. It was felt that the predator population was limited by the small stock of polychaetes and peracarideran crustaceans which had a maximum biomass in any one sample equivalent to 1.74 g dry/sq. m. The majority of the fish captured were foragers over a wide area. The main residents were the syngnathids and the gold-spotted killifish, Floridichthys carpio. (Maroncelli-Mass)
W78-09103

THE INFLUENCE OF TIDAL FLUX ON MICROBIAL BIOMASS IN SALT MARSH CREEKS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
C. W. Erkenbrecher, and I. H. Stevenson.
Limnology and Oceanography, Vol 20, No 4, p 618-625, July, 1975. 10 fig, 1 tab, 16 ref.

Descriptors: *Tides, *Streams, *Salt marshes, *Microorganisms, *Biomass, Tidal effects, Tidal waters, Water level fluctuations, Tidal marshes, Marshes, Wetlands.

The influence of tides on the concentration of the microflora in the water column of salt marsh creeks was assessed by investigating the fluctuations of aerobic, heterotrophic bacteria, particulate organic carbon (POC), and adenosine triphosphate (ATP) in two marsh creeks. Both reached maximum densities of bacteria just before low tide. The mean concentration at station 1 (located at the entrance to a small intertidal creek) over a tidal cycle was an order of magnitude greater than at station 2 (located at a sandy bottom creek draining both marsh and pine forest). POC increased twofold to fourfold during ebbtide in both systems. ATP concentrations at station 2, during ebbtide, increased about fourfold, and the fraction of the total carbon regarded as 'living' ranged from 2-24%. The abundance of microorganisms and organic carbon in tidal marsh creeks is neither static nor homogeneous over a tidal cycle. Level and flow of the tide and differences between creeks should be examined before extrapolating these sample results to a larger system. (Maroncelli-Mass)
W78-09104

SALT SPRAY AS A MICROENVIRONMENTAL FACTOR IN THE DISTRIBUTION OF BEACH PLANTS AT POINT REYES, CALIFORNIA,
California Univ., Davis. Dept. of Botany.
M. G. Barbour.
Oecologia, Vol 32, No 2, p 213-224, Spring, 1978, 5 fig, 3 tab, 20 ref.

Descriptors: *Beaches, *Sea spray, *Vegetation, *Distribution, *California, Topography, Winds, Tide Level, *Beach plants, Wind speed, *Point Reyes(CA).

Measurements of salt spray were made weekly for 15 spring weeks using a grid of 50 traps in a 32 m X 24 m plot of beach vegetation. Trap centers were 14 cm above the ground. Regressions or analyses of variance of wind speed and direction, rainfall, tide level, plot topography, and plant distribution were performed against salt spray. An ecologically and statistically significant salt spray gradient, which correlated with distance back from, and elevation above, mean tide line, was revealed. The front-most, lowest traps received 4-5 times the spray that the back-most, highest traps received. Steeper gradients resulted during weeks with moderate wind and spray, than in weeks with lower or higher wind speed. Plant distribution correlated with salt spray, and there is some evidence that it is a functional relationship. It appears that the salt spray load just above the beach plant canopy ranges from less than 1 to nearly 200 mg/sq dm. vertical trap surface/day depending on trap height, distance back from tide line, and wind speed. The plant canopy and sand surface received an order of magnitude less spray than that received by vertical traps. (Stihler-Mass)
W78-09106

RESPONSE OF LEAF WATER POTENTIAL TO PRESSURE CHANGES AT THE ROOT SURFACE OF CORN PLANTS,
Guelph Univ. (Ontario). Dept. of Land Resources Science.
R. A. Nulsen, G. W. Thurtell, and K. R. Stevenson.
Agronomy Journal, Vol 69, No 6, p 951-954, November-December 1977. 4 fig, 15 ref.

Descriptors: *Roots, Root systems, *Corn(Field), Soil water, Soil moisture, Transpiration, Crop response, Psychrometers, *Leaves.

The nature of the hydraulic continuum between the roots and leaves of intact plants requires further study to improve understanding of the effect of pressure changes. A large pressure chamber was designed to apply hydrostatis pressure to the roots of intact corn plants. The chamber permitted application of up to 6 bars pressure and allowed for in situ watering of the plants. Changes in leaf water potential resulting from changes in pressure applied to the roots were monitored in situ using a thermocouple dewpoint hygrometer. Responses of leaf water potential were consistently between 0.94 and 1.19 times the change in applied pressure, regardless of whether the pressure was being increased or decreased. When pressure was applied to very turgid plants, leaf water potential increased until it reached a value equal to the osmotic pressure of expressed xylem sap. Some time after this value was reached water droplets appeared on the leaf surface. The experiments showed that the hydraulic system within intact plants acts as a true continuum in that pressure changes at one end of the system are faithfully manifested at the other end of the system. If such changes are not observed some additional mechanism must be operating. (Skogerboe-Colorado State)
W78-09119

RECENT AND PLANNED MARSH ESTABLISHMENT WORK THROUGHOUT THE CONTIGUOUS UNTED STATES-A SURVEY AND BASIC GUIDELINES,
Environmental Concern, Inc., St. Michaels, MD.
E. W. Garbisch, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 464, Price codes: A13 in paper copy, A01 in microfiche. Contract Report D-77-3, April 1977. 276 p, 28 fig, 76 tab, 2 append. DACW 39-75-M-4215.

Descriptors: *Marshes, *Habitat improvement, *United States, Marsh plants, Estuarine environment, Estuaries, Dredging, Aquatic environment, Aquatic plants, Sediments, *Marsh establishment, Marsh development research.

Information on deliberate marsh establishment work that was planned, underway, or completed throughout the contiguous United States within the period of 1970-1976 was identified through literature review, interviewing sources of pertinent information, and the completion of distributed information request forms by various correspondents. Projects at 105 district locations have been completed for at least one year. Nine were totally unsuccessful due to vandalism and other reasons. Variation encountered in projects included 18 that existed in freshwater, 68 on the east coast, 17 on the Gulf Coast, 8 on the west coast, and 12 inland. Of the 105 projects, 59 were purely experimental as opposed to applied or partly so. Three principal maintenance and management requirements for marsh establishment determined by the study were removal of debris and litter dispositions, protection against water fowl depredation, and fertilization. (Roberts-ISWS)
W78-09217

2J. Erosion and Sedimentation

MASS TRANSPORT IN SHALLOW WATER WAVES,
British Columbia Univ., Vancouver Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08805

DISPERSION IN RIVERS AS RELATED TO STORAGE ZONES,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08808

ANTHROPOGENIC PARTICLES IN THE SEDIMENTS OF LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
C. I. Dell, and W. G. Booth.
Journal of Great Lakes Research, Vol 3, No 3-4, p 204-210, December 1977. 5 fig, 2 tab, 17 ref.

Descriptors: *Lake Erie, *Deposition(Sediments), *Lakes, *Sediments, Distribution patterns, Sampling, Surveys, On-site investigations, On-site data collections, Sediment distribution, Analysis, Trace elements, Carbon, *Anthropogenic particles, Chemical composition.

Several types of anthropogenic sand-sized particles have been identified in Lake Erie sediments. These types occur most abundantly along shipping lanes and in the southern part of the lake offshore from major industrial ports. The composition and distribution of the particles suggest that the 4 most common types are derived from the activities of coal-burning and coal-carrying ships. There is probably little impact on the chemistry of the lake system from these sand-sized particles. However, this study indicated that a major increase in the numbers and variety of anthropogenic particles occurred early in the 20th century, and therefore, they provide a useful time horizon for the study of modern sedimentary processes. (Humphreys-ISWS)
W78-08820

SEDIMENTATION RATES IN LAKE HURON AND GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, and N. S. Harper.
Journal of Great Lakes Research, Vol 3, No 3-4, p 215-220, December 1977. 2 fig, 2 tab, 23 ref.

Descriptors: *Lake Huron, *Sedimentation rates, *Deposition(Sediments), *Lakes, On-site investigations, Methodology, Surveys, On-site data collections, Pollen, Sampling, Polynology, Dating, Distribution patterns, Sediment distribution, Analysis, *Georgian Bay(Canada), Ambrosia pollen.

Present-day sedimentation rates were determined at 10 offshore locations, representative of depositional basins in Lake Huron and Georgian Bay. Sedimentation rates were calculated by averaging the weight of sediment deposited above the Ambrosia pollen horizon, dated at 1870. The rates are variable, ranging from a low of 35 g/sq m/yr to a maximum value of 780 g/sq m/yr. Sedimentation rates were greater in Lake Huron than in Georgian Bay, with the highest sedimentation rate in Saginaw Bay. The sedimentation rates in the main

basin of Lake Huron are in the same range as those found in Lake Michigan, Lake Ontario, and Lake Superior, but are less than those found in Lake Erie. The sedimentation rates in the 3 cores from Georgian Bay are generally less than those found in the other Great Lakes. (Humphreys-ISWS)
W78-08821

SURFICIAL SEDIMENT REDISTRIBUTION BY WAVE ENERGY: ELEMENT-GRAIN SIZE RELATIONSHIPS,
Michigan Univ. Ann Arbor. Great Lakes Research Div.
R. Rossmann, and E. Seibel.
Journal of Great Lakes Research, Vol 3, No 3-4, p 258-262, December 1977. 5 fig, 3 tab, 12 ref.

Descriptors: *Lake Michigan, *Sediments, *Lake shores, *Waves(Water), *Great Lakes, Shores, On-site investigations, Particle size, Data collections, Lakes, Velocity, Sediment transport, Movement, Sediment distribution, Sediment sources, Physical composition, Chemical composition.

Dissipation of wave energy as waves begin to feel the lake floor determines grain size variations for the surficial nearshore sediments of southeastern Lake Michigan. Variations of sediment composition mimic those of the silt- and clay-sized sediment fractions. Both grain size and compositional variations can be used to define the nearshore zone in the Great Lakes. (Humphreys-ISWS)
W78-08822

FAILURE SEQUENCE OF GULLY HEAD-WALLS IN WESTERN IOWA,
Missouri Agricultural Experimental Station, Columbia.
For primary bibliographic entry see Field 4D.
W78-08835

SEDIMENT YIELDS FOR SELECTED STREAMS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
C. T. Welborn, and R. B. Bezant.
Open-file Report 78-83, February 1978. 30 p, 3 fig, 3 tab, 6 ref.

Descriptors: *Sediment transport, *Texas, *Streams, *Sediment yield, *Sediment load, Data collections, Sediment discharge, Particle size, Suspended load, Sediment distribution, Sedimentation rates, Bed load, Streamflow, Flow rates.

The U.S. Geological Survey began a study to determine sediment yields for selected streams in Texas during the 1966 water year to provide information for areas in which sediment-yield data were meager or lacking. These data will aid in delineating problem areas and planning for water-resources development in the State. This report presents estimates of suspended-sediment loads and yields from 20 drainage basins ranging in area from 26 to 1,410 square miles. These estimates are based on samples collected periodically during water years 1966-74. Sediment loads ranged from 1,500 tons per year at the station North Fork Hubbard Creek near Albany to 278,000 tons per year at the station Wichita River at Wichita Falls. Sediment yields ranged from 15 tons per square mile per year in the drainage area of East Yegua Creek near Dime Box to 500 tons per square mile per year in the drainage area of Denton Creek near Justin. Sediment yields from drainage areas generally decrease from northwest to southeast across the State. (Woodard-USGS)
W78-08853

LAND ACCRETION AND AVULSION: THE BATTLE OF BLACKBIRD BEND,
For primary bibliographic entry see Field 6E.
W78-08968

DIFFUSION OF SEDIMENT IN LONG CHANNELS,
Uppsala Univ. (Sweden). Dept. of Mathematics.
G. Aronsson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No HY6, Proceedings Paper 13845, p 821-837, June 1978. 7 fig, 12 ref, 1 append.

Descriptors: *Dispersion, *Diffusion, *Sediments, *Model studies, Mathematical models, Distribution, Distribution patterns, Sediment distribution, Spatial distribution, Channels, Turbulence, Sediment transport, Sedimentation, Mathematics, *Long channels.

A model was presented, treating the transport of suspended material in a broad channel under simplifying assumptions. The motion of sediment was treated as a diffusion process, and a differential equation was derived. The form of an 'equilibrium distribution' g(y) was derived, corresponding to the classical distribution of Prandtl and Rouse. Mathematically the following two results were proven: (1) if a stationary (time dependent) state prevails downstream at a certain point P, then the distribution downstream P tends (with increasing distance to P) exponentially to the 'equilibrium distribution'; and (2) if the sediment distribution in the incoming downstream P will tend to the stationary solution exponentially with time. Although these results seem to be physically evident, they apparently have not been proven before. (Sims-ISWS)
W78-09035

DETERMINATE HYDRAULIC GEOMETRY OF RIVER CHANNELS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 8B.
W78-09037

EARTHFLOWS IN FRANCISCAN MELANGE, VAN DUZEN RIVER BASIN, CALIFORNIA,
National Park Service, Orick, CA. Redwood National Park.
H. M. Kelsey.
Geology, Vol. 6, No. 6, p 361-364, June 1978. 3 fig, 1 tab, 13 ref.

Descriptors: *Landslides, *California, *Geomorphology, *Erosion, On-site investigations, Sediment yield, Surveys, Rivers, Watersheds(Basins), Gullies, Movement, *Van Duzen River Basin(Calif), Earthflow.

Large earthflows are a significant source of sediment in the highly sheared and easily eroded Franciscan melange of the northern California Coast Ranges. Earthflows are active during the winter wet season, and their movement averages 2.4 to 4.0 m/yr. Fluvial sediment yield from the gullied and broken earthflow surface is about equal to sediment yield by mass movement. Indirect evidence suggests that changes in vegetation cover due to grazing beginning in the nineteenth century may have increased the rate of earthflow movement. (Humphreys-ISWS)
W78-09054

SHOALING RATE PREDICTION USING A SEDIMENTATION TANK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09059

INTERMITTENT ARCTIC STREAMS AND THEIR INFLUENCE ON LANDFORMS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C
W78-09090

NUTRIENT LOSSES IN SURFACE RUNOFF FROM A NATIVE PRAIRIE,
Agricultural Research Service, Morris, MN. North Central Soil Conservation Research Center.
D. R. Timmons, and R. F. Holt.
Journal of Environmental Quality, Vol. 6, No. 4, p 369-373, October-December 1977. 5 tab, 22 ref.

Descriptors: *Nutrients, Fertilizers, Fertilization, Runoff, *Minnesota, *Snowmelt, Rainfall, Rainfall-runoff-relationships, *Nitrogen, *Phosphorus, Potassium, Sodium, Calcium, Chemical oxygen demand, *Agricultural runoff, Magnesium.

Nutrient losses in surface runoff from a native prairie were determined for 5 years. The prairie, dominated by little bluestem was on a Barnes loam soil in west-central Minnesota. Snowmelt runoff accounted for 80% of the average annual runoff. After spring thaw, rainfall caused appreciable runoff (37% of annual) during 1 year only. Depending on chemical parameter, 63 to 88% of the average annual nutrient loads were transported by snowmelt runoff. Average annual total nitrogen (N) and total phosphorus (P) losses were 0.8 and 0.1 kg/ha, respectively, and organic N and organic (+ hydrolyzable) P comprised 68 and 82% of their respective annual losses. Average annual cation losses ranged from about 0.1 to 1.8 kg/ha and, except for 1 year, were in the order K>Ca>Mg>Na. Average weighted concentrations for all parameters were higher for rainfall runoff than for snowmelt runoff. Nutrient losses from native prairie represent natural levels for comparing the effects of different land uses on nutrient loads in surface runoff. (Skogerboe-Colorado State)
W78-09110

RESOURCE ADEQUACY IN LIMITING SUSPENDED SEDIMENT DISCHARGES FROM AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
E. O. Heady, and A. D. Meister.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 289-293, November-December 1977. 3 fig, 6 tab, 3 ref.

Descriptors: *Computer programs, Model studies, Pollution, Agriculture, Water surface, Irrigation, Erosion, Sediments, *Suspended solids, *Sediment discharge, *Economic impact.

The Iowa State University national programming model was used to evaluate the economic impacts of controlling nonpoint pollution from agriculture and to assess whether environmental improvement goals could be met in conjunction with high agricultural exports. Alternatives analyzed included a base solution, high exports, land and water conservation, and environmental enhancement. High expots could be attained simultaneously under the land and water conservation alternative. Exports must be reduced, however, under the environmental enhancement alternative. To meet exports under the land and water conservation alternative, 10 million acres of wetlands would need to be converted to cropland. Returns to land would increase considerably under all alternatives other than the base solution. There would be wide variations among regions, however. In general, a relative redistribution of income from irrigated to dry lands and from erosive to nonerosive farming regions would occur. (Skogerboe-Colorado State)
W78-09141

PRELIMINARY STUDIES ON CHITIN DECOMPOSITION IN LAKE ERIE SEDIMENTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-09152

LACK OF CORRELATION BETWEEN THE COMPOSITION OF SEDIMENTS AND THEIR TOXICITY TO ALGAE,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
For primary bibliographic entry see Field 5A.
W78-09160

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-09164

SUSPENDED SEDIMENT DISCHARGE OF THE SUSQUEHANNA RIVER TO NORTHERN CHESAPEAKE BAY, 1966 TO 1976,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
M. G. Gross, M. Karweit, W. B. Cronin, and J. R. Schubel.
Estuaries, Vol. 1, No. 2, p 106-110, June 1978. 4 fig, 2 tab, 13 ref.

Descriptors: *Sediment discharge, *Chesapeake Bay, *Maryland, *Suspended load, Rivers, Sediment load, Data collections, Sediment yield, Streamflow, Flood flow, *Susquehanna River(Md).

Between 1966 and 1976, the Susquehanna River at Conowingo, Maryland, discharged approximately 50 million metric tons of suspended sediment to Northern Chesapeake Bay. About 40 million metric tons were discharged in two floods associated with hurricanes: Agnes (24-30 June 1972) and Eloise (26-30 September 1975). In the six years with complete records and no major floods, the Susquehanna River discharged 0.9 plus or minus 0.3 million metric tons of suspended sediment per year at Conowingo Dam. About 50 to 60% of the annual sediment discharge usually is discharged in the spring floods (March, April) resulting from snowmelt. Except for years with major floods, suspended sediment transport at Harrisburg, Pennsylvania, exceeds sediment discharge at Conowingo, Maryland, probably due to sediment deposition in the lower river and behind three hydroelectric dams. (Humphreys-ISWS)
W78-09208

AN EXPERIMENTAL STUDY OF GEOMORPHIC THRESHOLDS,
Colorado State Univ., Fort Collins. Dept. of Geology.
S. A. Schumm.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 527, Price codes: A03 in paper copy, A01 in microfiche. Final Report 11515.4-EN, April 1, 1977. 25 p, 4 fig, 12 ref. ARO DAHCO4-74-G-0020.

Descriptors: *Erosion, *Sedimentation, *Rivers, *Geomorphology, Laboratory tests, Model studies, Alluvial fans, Sediments, Fluvial sediments, Sediment transport, Sediment yield, Watersheds(Basins), On-site investigations, Sedimentology.

Both the experimental and field phases of the project indicated that geomorphic thresholds exist and that this concept can be of significance in the recognition of incipiently unstable components of the landscape. For example, within a given region, valley floor slopes, alluvial fan slopes, and channel sinuosity usually vary over an order of magnitude. It should be possible to identify at what range of slopes the landforms are unstable and subject to major erosional or depositional change, as a result of a triggering hydrologic event or due to man's intervention. The results of this project have a significant contribution to make not only in the development of preventive conservation but also to river control engineering. The geomorphic approach requires an understanding of landform history, which can provide a basis for working with the natural system in order to accomplish conservation or river stability goals. (Sims-ISWS)
W78-09216

A MODEL TO INVESTIGATE THE INFLUENCE OF SUSPENDED SEDIMENT ON THE MASS TRANSPORT OF A POLLUTANT IN OPEN CHANNEL FLOW,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-09219

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
For primary bibliographic entry see Field 5B.
W78-09225

RAINFALL SIMULATOR FOR EVALUATING EROSION RATES AND SEDIMENT FROM ROW SIDESLOPES,
Agricultural Research Service, oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 7B.
W78-09253

PREDICTING SEDIMENT YIELD FROM AGRICULTURAL LAND,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
C. H. Shelton.
Paper No. 77-2526, presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 16 p, 4 fig, 3 tab, 6 ref.

Descriptors: Sediments, *Sediment yield, Agriculture, Simulation analysis,Runoff, Soil erosion, *Forecasting, Equations, *Watershed management, Rainfall-runoff relationships, *Rainfall intensity.

Three forms of sediment-yield prediction equations were developed and tested with data from 105 runoff events on five watersheds. Runoff volume accounted for variations in yield better than maximum 30-minute intensity ranfall, erosive-potential rainfall factor, or peak runoff rate; and the best prediction equation was obtained after logarithmic transformation of variables. (Skogerboe-Colorado State)
W78-09254

WATER QUALITY LOADINGS DURING THIRTEEN STORMS ON THE CADDO RIVER, ARKANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W78-09255

THE ANSWERS MODEL: A PLANNING TOOL FOR WATERSHED RESEARCH,
Arkansas Univ., Fayetteville. Dept. oof Agriculture Engineering.
D. B. Beasley, E. J. Monke, and L. F. Huggins.
Paper No. 77-2532 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977. Chicago, Illinois, 21 p, 12 fig, 2 tab, 15 ref.

Descriptors: *Model studies, *Computer programs, Hydrology, Erosion, Soil erosion,Watershed management, *Simulation analysis, *ANSWERS model, Planning.

The ANSWERS model, a distributed parameter watershed hydrology and erosion simulator is presented. The basic concepts and the watershed hydrology and erosion simulator is presented. The basic concepts and the pertinent component relationships are described. In addition, sample outputs from the ANSWERS model are included. (Skogerboe-Colorado State).
W78-09257

FILTRATION OF NON-HOMOGENEOUS SEDIMENT BY SIMULATED VEGETATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
J. C. Hayes, and B. J. Barfield.
Paper No. 77-2513, presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 18 p, 7 fig, 2 tab, 14 ref.

Descriptors: *Model studies, *Sediment filtration, Sedimentation, Sediment loads, Open channels, Simulation analysis, Hydrographs, Vegetation, *Vegetation effects.

A nonsteady state model is presented for determining the sediment filtration of an artificial grass filter under varying flowrates, sediment loads, particle sizes, channel slopes, andmedia density. Good agreement was found between predicted and observed profiles for given flow conditions and inflow hydrographs using laboratory data. (Skogerboe-Colorado State).
W78-09259

SOIL EROSION AND SEDIMENTATION: ANALYSIS OF APPLICABLE LAW,
Virginia Polytechnic Inst. and State Univ., Blacksburgh Virginia Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W78-09273

2K. Chemical Processes

SOME METHODS AND INSTRUMENTS FOR AUTOMATED MONITORING OF THE CHEMICAL COMPOSITION OF SURFACE WATERS,
Hydrochemical Inst. Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W78-08812

SOME THEORETICAL ASPECTS OF STABILITY AND SOLUBILITY OF INORGANIC ARSENIC IN THE FRESHWATER ENVIRONMENT,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-08834

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08848

REDOX PROCESSES AT SURFACES OF MANGANESE OXIDE AND THEIR EFFECTS ON AQUEOUS METAL IONS,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. D. Hem.
Chemical Geology, Vol 21, p 199-218, 1978. 4 fig, 3 tab, 32 ref.

Descriptors: *Chemical reactions, *Manganese, *Oxidation-reduction potential, *Metals, *Aqueous solutions, Reviews, Publications, Evaluation, Ion exchange, Cobalt, Lead, Nickel.

This paper reviews recent literature relating to Mn oxide deposition and sorption processes and explores the thermodynamics of certain surface redox mechanisms that may occur at the water--oxide interface. Such processes may help explain the behavior of some of the metal ions that occur in low concentrations in aqueous systems. Diversion of some electron transfers from Mn species to other metal ions can greatly decrease the equilibrium solubility of Co, Pb, Ni and some other elements in the presence of mixed-valence Mn oxides. Some scavenging and coprecipitation effects involving Mn oxides may be attributable to redox processes. Equilibrium solubilities for Mn, Co and Pb are summarized in four graphs. (Woodard-USGS)
W78-08851

STABILITY OF FLUORIDE COMPLEX WITH SILICA AND ITS DISTRIBUTION IN NATURAL WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
C. E. Roberson, and R. B. Barnes.
Chemical Geology, Vol 21, p 239-256, 1978. 2 fig, 7 tab, 30 ref.

Descriptors: *Geochemistry, *Fluorides, *Silica, *Acidic water, *Thermal water, Boron, Chemical reactions, Analytical techniques, Electrodes, Hawaii, *Complexes, Fluoride ion, *Silicic acid, *Stability constant, Boric acid, Volcanic condensates.

The stability constant at 25 deg C for the reaction to form SiF6 was calculated from experimental data using ion-specific electrodes. Use of fluoride activity measurements along with appropriate data permits one to evaluate readily the importance of silicic acid and fluoride complexing in aqueous solutions. Such complexing can be very significant as illustrated by a very restricted class of natural solutions, volcanic condensates. Most other acidic natural water solutions are likely to contain other constituents (for example, Fe and Al) which effectively compete with Si for the fluoride. (Woodard-USGS)
W78-08852

ADSORPTION OF ALUMINUM BY A SMECTITE: I. SURFACE HYDROLYSIS DURING CA2(+)(-)AL3(+) EXCHANGE,
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08906

ADSORPTION OF ALUMINUM BY A SMECTITE: II. AN AL3(+)(-) CA2(+),
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08907

APPLICATIONS AND MISAPPLICATIONS OF THE LANGMUIR EQUATION TO SOIL ADSORPTION PHENOMENA,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 2G.
W78-08909

AMMONIA VOLATILIZATION FROM SOILS: EQUILIBRIUM CONSIDERATIONS,
Technion - Israel Inst. of Tech. Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08910

ORGANIC PHOSPHATE TRANSPORT AND HYDROLYSIS IN SOIL: THEORETICAL AND EXPERIMENTAL EVALUATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5B.
W78-08911

COLORIMETRIC DETERMINATIONS OF EXCHANGEABLE AMMONIUM, UREA, NITRATE, AND NITRITE IN A SINGLE SOIL EXTRACT,
Texas A and M Univ., Lubbock. Agricultural Research and Extensions Center.
For primary bibliographic entry see Field 2G.
W78-08924

EVALUATION OF A WATER ANALYSIS KIT,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-09111

ROLE OF GROUND WATERS IN THE FORMATION OF THE CHEMISTRY OF RIVER WATERS DURING THE SUMMER-AUTUMN LOW-FLOW PERIOD IN PERMAFROST REGIONS, AS EXEMPLIFIED BY THE LENA-INDIGIRKA REGION,
V. M. Ivanik, and N. V. Veselovskiy.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 226-234, 1976. 2 fig, 2 tab, 30 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 60, p 17-29, 1974.

Descriptors: *Rivers, *Water chemistry, *Groundwater, *Permafrost, Discharge(Water), Groundwater movement, Chemicals, Ions, Low flow, Summer, Autumn, Mountains, Karst, Surface waters, Meltwater, Hydrology, *USSR.

The conditions of groundwater inflow into rivers in permafrost regions are unusual and very different from conditions in regions outside the permafrost zone. The degree of influence of groundwaters on the chemistry of river water is determined by the rate of groundwater inflow into rivers and their chemical composition. Most of the rivers of the permafrost zone are fed in the summer-autumn, low-flow period by the suprapermafrost waters of the active layer (i.e., essentially soil-groundwaters). Waters of this genetic category are represented in their purest form in the channels of rivers in the basins of which permafrost is continuous. Such conditions are typical of all large lowland areas in the Lena-Indigirka region and of a considerable part of the Central Siberian tableland (including Central Yakutia), where deep waters seldom discharge at the surface. In the region of island and discontinuous permafrost and also where the permafrost table is deep, the water in the rivers during the summer-autumn, low-flow period is represented by 'typical' groundwaters in nearly pure form. Furthermore, deep circulating groundwaters (i.e., subpermafrost waters) discharge into some rivers together with the waters of the upper aquifers. Discharges of groundwaters are local and confined mainly to tectonic fault zones and karst areas. (Sims-ISWS)
W78-09209

SEASONAL VARIATIONS OF TRITIUM AND OTHER CONSTITUENTS IN GROUNDWATER IN THE CHALK NEAR BRIGHTON, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 5A.
W78-09210

2L. Estuaries

WAVE FORCES ON MULTIPLE VERTICAL CYLINDERS,
Chicago Bridge and Iron Co., Plainfield, IL. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W78-08801

HYDRODYNAMIC DRAG FORCES ON GROUPS OF FLAT PLATES,
Manchester Univ. (England). Simon Engineering Labs.
For primary bibliographic entry see Field 8B.
W78-08802

FINITE ELEMENT MODELLING OF NEARSHORE CURRENTS,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W78-08803

VIRTUAL MASS OF COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08804

MASS TRANSPORT IN SHALLOW WATER WAVES,
British Columbia Univ., Vancouver Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08805

WAVE SETUP AND DESIGN WATER LEVEL,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 8B.
W78-08806

REVIEW OF OSCILLATORY BOUNDARY LAYER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08811

INTRA-ANNUAL VARIATIONS IN THE CONCENTRATION OF BIOGENIC ELEMENTS AND DISSOLVED GASES IN THE EASTERN PART OF THE BALTIC SEA,
For primary bibliographic entry see Field 5B.
W78-08816

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 1 AND 2.
Winzler and Kelly Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 210, Price codes: A25 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-17, August 1977, 400 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, Geology, Baseline studies, Resources development, Water resources, *Outer Continental Shelf, Physical oceanography, Environmental conditions.

The summary of conflicts and hazards, geological features, climate, and physical oceanography are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, informational and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08895) (Sinha-OEIS)
W78-08894

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 211, Price codes: A07 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-17, August 1977, 494 p.

Descriptors: *California, *Coasts, *Continental Shelf, *Water quality, Baseline studies, Resources development, Water resources, Environment, Deltas, Bays, *Outer Continental Shelf, Physical oceanography, Chemical oceanography, Environmental conditions.

The chemical oceanography; physical and chemical oceanography of San Francisco Bay; and water quality of the rivers and streams, embayments and sloughs, and the nearshore oceanic water of central and northern California are included in this section of a comprehensive literature survey abnd interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, informational and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08894) (Sinha-OEIS)
W78-08895

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 534, Price codes: A18 in paper copy, A01 in microfiche. Alaska Department of Education, Division of State Libraries and Museums Final Report to NOAA, Office of Coastal Zone Management, 1977, 421 p. Rosier, K. (compiler). NOAA Grant No 04-6-158-44029.

Descriptors: *Alaska, *Continental Shelf, *Bibliographies, *Resources development, *Baseline studies, *Oil pollution, Water pollution effects, Ecosystems, Environmental effects, *Outer Continental Shelf, Petroleum development.

The bibliography lists publications and materials on offshore oil development and the impact of offshore oil development on the onshore areas. It contains full bibliographic information and the location of the material in Juneau, Alaska. It contains 2176 titles and is indexed by personal author, corporate author, title, and subject. The bibliography is divided into the following broad categories: (1) directories, encyclopedias and indexes, (2) bibliographies and abstracts, (3) general works, (4) physical and earth sciences, (5) bibliogical sciences, (6) technology, (7) industries, (8) pollution, (9) social and economic considerations, and (10) law and legislation. The citations were selected for application to Alaskan oil development from a wide range of other geographical areas including Canada, the North Sea, Continental Europe, the Gulf of Mexico, the California Coast and Alaska. (Sinha-OEIS)
W78-08896

DETERMINATION OF PHOSPHATE FLUXES ACROSS THE SEDIMENT-WATER SURFACE OF THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-08897

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 1 OF 3.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 212, Price codes: A23 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-19, August 1977, 538 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Benthos, Plankton, *Outer Continental shelf, Marine biology.

Chapters describing the benthic fauna, benthic flora, phytoplankton and zooplankton of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08929 and W78-08930) (Sinha - OEIS)
W78-08928

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 2 OF 3.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 213, Price codes: A19 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-20, August 1977, 431 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Mammals, Fisheries, Ecology, *Outer Continental Shelf, Marine biology.

Chapters describing marine mammals and fisheries of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socio-economic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for futher research, and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-8928 and W78-08930) (Sinha - OEIS)
W78-08929

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 3 OF 3,
Winzler and Kelly., Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 214, Price codes: A25 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-21, August 1977. 583 p, numerous fig, tab, ref. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Birds, Vegetation, Wildlife, Ecology, *Outer Continental Shelf, Marine biology, Petroleum development.

Chapters describing the marine and shore birds, terrestrial vegetation and wildlife, and specially protected biota of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08928 and W78-08929) (Sinha-OEIS)
W78-08930

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 1 OF 2.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 215, Price codes: A99 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-22, August 1977, 636 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Sociology, Economics, Land use, Resources, *Outer Continental Shelf, Petroleum development.

Chapters describing the industrial, commercial, and military activity, petroleum industry, transportation systems, demography and socioeconomic considerations, and land and water use of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08932) (Sinha-OEIS)
W78-08931

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly, Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 216, Price codes: A22 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-23, August 1977, 518 p. Contract AA550-CT6-52.

Descriptors: *California, *Coasts, *Continental Shelf, *Resources development, Environmental effects, Baseline studies, Water pollution, Sociology, Economics, Land use, Resources, Water resources, *Outer Continental Shelf, Petroleum development.

Chapters describing the pollution sources, historical and archaeological resources, and recreational site vulnerability of central and northern California are included in this section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties from Ventura County to the Oregon Border, inclusive of the northern Channel Islands. Each chapter contains information on the existing environment, information and data gaps, ongoing research, recommendations for further research and a list of references. Emphasis is given to offshore development-related considerations. (See also W78-08931) (Sinha-OEIS)
W78-08932

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 217, Price codes: A99 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management Report No. BLM-ST-78-24, August 1977, 791 p. Contract AA550-CT6-52.

Descriptors: *Bibliographies, *California, *Coasts, *Continental Shelf, Water pollution, Ecology, Environment, Baseline studies, Biota, Fisheries, Birds, Mammals, Resources, Resources development, *Outer Continental Shelf, Petroleum development.

Over 12,000 citations are included in the master bibliography section of a comprehensive literature survey and interpretation of existing knowledge in physical and biological sciences and the existing socioeconomic and cultural conditions of the coastal counties of central and northern California from Ventura county to the Oregon Border, inclusive of the Northern Channel Islands. The bibliography cntains all references cited in the individual subject chapters as well as other uncited references relevant to a particular subject. An effort has been made to minimize redundancy between chapters and to provide cross-references to assist the reader in locating either more detailed or complementary information in the companion chapters of the summary. A chapter which condenses certain data of obvious significance to the assessment of the possible effects on the environment of offshore energy resource development has been provided within each broad subject area. The chapters are: Summary of Conflicts and Hazards (Physical Conditions); Specially Protected Biota (Biological Conditions); and Recreational Site Vulnerability (Socioeconomic Conditions). (Sinha-OEIS)
W78-08933

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
For primary bibliographic entry see Field 5A.
W78-08934

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - II. DISTRIBUTION OF HYDROCARBON-OXIDIZING BACTERIA IN THE OIL-POLLUTED AREAS CAUSED BY THE MIZUSHIMA OIL REFINERY ACCIDENT (IN JAPANESE),
Simonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W78-08964

THE NEWFOUNDLAND OFFSHORE CLAIMS: INTERFACE OF CONSTITUTIONAL FEDERALISM AND INTERNATIONAL LAW,
Toronto Univ. (Ontario). Faculty of Law.
For primary bibliographic entry see Field 6E.
W78-08981

THAT GULF OF MAINE DISPUTE: CANADA AND THE UNITED STATES DELIMIT THE ATLANTIC CONTINENTAL SHELF,
For primary bibliographic entry see Field 6E.
W78-08983

SYMPOSIUM ON COASTAL ZONE MANAGEMENT, THE UNIVERSITY OF WEST FLORIDA.
University of West Florida, Pensacola.
For primary bibliographic entry see Field 6B.
W78-08985

GUIDELINES FOR EVALUATING PROPOSED WETLANDS ALTERATIONS IN SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept., Columbia.
For primary bibliographic entry see Field 6E.
W78-08987

COASTAL ZONE ACT.
For primary bibliographic entry see Field 6E.
W78-08994

VERTICAL MIXING IN STRATIFIED TIDAL FLOWS,
Hydraulic Research Station, Wallingford (England). Estuary Div.
N. V. M. Odd, and J. G. Rodger.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13599, p 337-351, March 1978. 7 fig, 11 ref, 2 append.

Descriptors: *Mixing, *Tidal waters, *Stratified flow, Mathematical models, Model studies, On-site investigations, On-site data collections, Turbulence, Turbulent flow, Tides, Salinity, Suspended solids, Estuaries.

A set of mixing length functions based on a adaptation of the theories of Prandtl, Rossby, Montgomery, and Ellison were presented as a means of calculating the internal shear stresses and vertical flux of solutes in gradually varying turbulent stratified tidal flows. Field observations, made in a straight canalized reach of an estuary, were used to determine the best-fit values of empirical coefficients in generalized relationships between the mixing lengths and gradient Richardson Number. The main purpose of the research was to improve the representation of vertical exchange processes in mathematical models of estuaries. (Sims-ISWS)
W78-09029

COASTAL BARRIER CHANGES, 1770-1867, BISCAYNE BAY AREA, FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
R. E. Chardon.
Geology, Vol. 6, No. 6, p 333-336, June 1978. 3 fig, 25 ref.

Descriptors: *Shores, *Barrier islands, *Florida, *Geomorphology, Coasts, Beaches, Sand spits, Movement, Inlets(Waterways), Analytical techniques, Analysis, Estuaries, *Biscayne Bay(Fla).

Examination of properly evaluated historical maps of the preurban (that is, 1770-1867) sedimentary barrier bordering northern Biscayne Bay in southeastern Florida indicated: (1) net shore retreat averaging about 3.0 m/yr in the northern Atlantic portion of the barrier; (2) net spit accretion in two areas to the south, the first averaging about 70 m/yr and the second adding about 1,000,000 sq m to the barrier; (3) the migration and subsequent closing of a tidal inlet by A.D. 1822; (4) the opening of a new tidal inlet sometime between 1829 and 1838; (5) a probable association between these processes and bedrock topography; and (6) the positive value of historical maps as data bases for certain types of coastal change, especially in urban areas. (Humphreys-ISWS)
W78-09053

CHANNEL ENTRANCE RESPONSE TO JETTY CONSTRUCTION,
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 8B.
W78-09058

SHOALING RATE PREDICTION USING A SEDIMENTATION TANK,
Coastal Engineering Research Center, Fort Belvoir, VA.
C. H. Everts.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 725, Price codes: A02 in paper copy, A01 in microfiche. American Society of Civil Engineers, Proceedings of the Specialty Conference on 'Civil Engineering in the Oceans/III' held at the University of Delaware, Newark, Delaware, p 294-312, June 9-12, 1975. 7 fig, 1 tab, 4 ref.

Descriptors: *Coasts, *Harbors, *Sedimentation rates, *Alaska, *Shoals, Sedimentation, Tidal effects, Currents(Water), Suspended solids, Tides, *Tidal flats, *Enclosed-type harbors, River stage.

Results are reported of an experiment carried out in a tidal flat near Anchorage, Alaska, where a sedimentation tank was used to obtain data related to shoaling rate in the tide harbor. Depositional conditions within the tank were evaluated for testing the similarity to those in a half-tide harbor at Dillingham, Alaska. In most cases, it was observed that the tank did not account for the effects of a long navigational channel. The pattern of sedimentation in the tank indicated that it was similar to enclosed-type harbor situations where suspended sediment enters or is released from the harbor when water surface rises or falls as under the action of a tide or changing river stage. The sedimentation rate was uniform throughout the harbor. (Bhowmik-ISWS)
W78-09059

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
For primary bibliographic entry see Field 6G.
W78-09070

PRIMARY PRODUCTIVITY OF COASTAL MARSHES IN MISSISSIPPI,
Mississippi State Univ., Mississippi State, Dept. of Zoology.
A. A. De La Cruz.
Gulf Research Reports, Vol. 4, No. 3, p 351-356, December, 1974. 1 fig, 3 tab, 12 ref.

Descriptors: *Primary productivity, *Coastal marshes, *Mississippi, Productivity, Marsh plants, Rooted aquatic plants, Marshes, Gulf Coastal Plain, Wetlands, Spartina, Juncus.

The annual net primary production of nine types of marsh communities common in Mississippi Gulf Coast estuaries were studied by means of the Harvest Method. Production values ranged from 600 g/sq m/yr for a Sagittaria lancifolia marsh to 2330 g/sq m/yr for a Phragmites communis marsh. Primary productivity values for the other marsh types are Juncus roemerianus - 1697 g/sq m/yr, Scirpus robustus - 1056 g/sq m/yr. Spartina cynosuroides -

2190 g/sq m/yr, Spartina patens - 1922 g/sq m/yr, Spartina alterniflora tall form - 1964 g/sq m/yr, S. alterniflora short form - 1089 g/sq m/yr, and Distichlis spicata - 1484 g/sq m/yr. Annual net productivity in Mississippi marshes are generally slightly higher than those reported for the Atlantic marshes. (Stihler-Mass)
W78-09079

NITROGEN FIXATION IN A SALT MARSH,
Lancaster Univ., Bailriggs (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-09082

TIDAL IMMERSION OF SPARTINA MARSH AT BRIDGEWATER BAY, SOMERSET,
Nature Conservancy Roughmoor, Taunton (England).
J. V. Morley.
Journal of Ecology, Vol. 61, No. 2, p 383-386, July, 1973. 2 fig, 6 ref.

Descriptors: *Marshes, *Tidal effects, *Water level fluctuations, Coastal marshes, Salt marshes, Tides, Water levels, Wave action, *Spartina, Bridgewater Bay(Somerset).

The seaward spread of Spartina anglica at Bridgewater Bay, Somerset, is examined in relation to periods of tidal immersion. Spartina growing at the lowest level immersed for a maximum of 4.4 h duration during spring tides, with an annual total of 2000 h. As this is less than one-third of the amount of immersion recorded at Poole Harbour where immersion has been shown to be the critical factor limiting the spread of Spartina, the marsh at Bridgewater Bay should still be advancing seawards. Recent observations have shown that during the last 10 years little or no seaware advance has occurred, and it is suggested that wave action is responsible. (Maroncelli-Mass)
W78-09084

NITROGEN FIXATION IN FLAX POND: A LONG ISLAND SALT MARSH,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09085

A SUMMARY OF POPULATION SURVEYS OF THE AMERICAN ALLIGATOR IN LOUISIANA COASTAL MARSHES, 1970-1974,
Louisiana Wildlife and Fisheries Commission, Grand Chenier. Refuge Div.
T. Joanen, and L. McNease.
Preliminary report prepared by the Refuge Division of the Louisiana Wild Life and Fisheries Commission, September 19, 1974. 5 p, 3 tab, 3 ref.

Descriptors: *Coastal marshes, *Louisiana, Reptiles, Surveys, Animal populations, *Alligators.

Alligator nests were counted in early July of each year from 1970 through 1974 using a helicopter to fly predetermined transects. Nesting density was used to estimate total population size. The Louisiana coastal alligator population was estimated at 214,000 in 1974, a 33 percent increase over the average of the previous 3 years. Fifty-seven percent of the 1974 population was located on privately owned land; 43 percent was on refuges and wildlife management areas. Three distinct coastal marsh zones characterized by age, origin and physiographic features, percent of total area occupied by each marsh zone, and percent of the alligator population occurring in each marsh zone were: chenier plain, 34.9, 67.1; sub-delta, 57.2, 26.6; active delta, 6.3, 7.9. (Stihler-Mass)
W78-09088

LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE FORM ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 7B.
W78-09093

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
R. H. Chadreck, and A. W. Palmisano.
Ecology, Vol. 54, No. 5, p 1118-1123. Late Summer, 1973. 1 fig, 3 tab, 18 ref.

Descriptors: *Hurricanes, *Marshes, *Vegetation, Rooted aquatic plants, Coastal marshes, Effects, Wetlands, Louisiana, Mississippi River, Recovery.

The active delta of the Mississippi River was sampled in August 1968 to determine plant species composition, plant coverage, and soil and water chemistry. Hurricane Camille struck this area in August 1969. The delta was resampled 2 weeks following the hurricane and again 1 year after the hurricane. The hurricane resuled in a drastic reduction of vegetation. Regrowth was rapid in the delta marshes and after 1 year plant coverage approached pre-hurricane levels of abundance; recovery was slower in ponds and lakes, however. Loss of vegetation was mainly a result of the sweeping action of wind and water. Plants were either uprooted or ripped apart and carried away by the current. Water salinity increased with the hurricane but declined by the following year and appeared to have only a slight effect on marsh vegetation. Plant species varied in their response to the hurricane. (Stihler-Mass)
W78-09096

A METHOD OF MEASURING SALT MARSH INUNDATION,
Aarhus Univ. (Denmark). Botanical Inst.
For primary bibliographic entry see Field 7B.
W78-09098

PRODUCTION AND DYNAMICS OF SALT MARSH VEGETATION AND THE EFFECTS OF EXPERIMENTAL TREATMENT WITH SEWAGE SLUDGE: BIOMASS, PRODUCTION, AND SPECIES COMPOSITION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-09099

CONSERVATION OF COASTAL HABITATS OF WADERS IN THE SOUTH-WESTERN CAPE, SOUTH AFRICA,
Cape Town Univ. (South Africa). Percy Fitz-Patrick Inst. of African Ornithology.
J. Cooper, R. W. Summers, and J. S. Pringle.
Biological Conservation, Vol 10, No 4, p 239-247, December, 1976. 1 fig, 3 tab, 20 ref.

Descriptors: *Shorebirds, *Wetlands, Conservation, *Africa, Birds, Habitats, South Africa, *Waders.

Counts of waders (Aves: Charadrii) in the coastal regions of the southwestern Cape. South Africa were made in the austral summer 1975/76. Forty-four coastal wetlands and 49 sections of coastline were visited. The total wader population was estimated to be 119,000, of which 103,000 (86%) were Palaerctic migrants. No species can be considered to be endangered in the south-western Cape but a decrease in available wader habitat has occurred. As a Contracting Party to the 'Ramsar Convention on Wetlands of International Importance, Especially as Waterfowl Habitat', South Africa should increase its protected wetlands habitats. Ten major wetlands in the south-western Cape, containing 68% of the estimated total wader population, are recommended for elevation to nature reserve status. (Stihler-Mass)
W78-09101

TROPHIC RELATIONSHIPS IN A SEAGRASS COMMUNITY (THALASSIA TESTUDINUM), IN CARD SOUND, FLORIDA. FISH DIETS IN RELATION TO MACROBENTHIC AND CRYPTIC FAUNAL ABUNDANCE,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2I.
W78-09103

THE INFLUENCE OF TIDAL FLUX ON MICROBIAL BIOMASS IN SALT MARSH CREEKS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 2I.
W78-09104

COASTAL MARSH PRODUCTIVITY: A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 5C.
W78-09108

DISTRIBUTION AND BIOTIC EFFECTS OF NUTRIENTS IN FLATHEAD LAKE, MONTANA,
Montana Univ., Flathead Lake. Biological Station.
For primary bibliographic entry see Field 5C.
W78-09155

OBSERVATIONS OF ALGAL ZONATION RESULTING FROM COMPETITION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-09159

PHYTOPLANKTON GROWTH AND CHLOROPHYLL LEVELS IN THE SACRAMENTO - SAN JOAQUIN DELTA THROUGH SAN PABLO BAY,
Bureau of Reclamation, Sacramento, CA. Mid-Pacific Region.
For primary bibliographic entry see Field 5C.
W78-09163

FLOOD PROFILES IN COMBINED TIDAL-FRESHWATER ZONES,
Agency for International Development, Dacca (Bangladash).
J. D. Jenkins, and H. M. Johnson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, NO. HY6, Technical Note, p 919-922, June 1978. 5 fig.

Descriptors: *Flood profiles, *Tidal waters, *Rivers, *Florida, Estuaries, Freshwater, Frequency, Flood flow, Analytical techniques, Water levels, Flood peak, Flood routing, Flood frequency, *Peace River(Fla).

A problem of interest in flood frequency studies is the establishment of flood profiles near coastal areas where a tidal influence exists or where backwater may affect small streams entering large reservoirs. This paper described a solution used for a flood study in Florida on Peace River from Punta Gorda to Arcadia. The paper described how the 100-yr flopd profile was calculated in the river reach affected by both tidal and freshwater runoff flooding. The standard-step method for computing gradually varied flow was used for defining the necessary freshwater flood profiles. Mean high tide was used as the starting elevation. The U.S.

Geological Survey E-431 computer program was used for computations. The tidal surge profile was assumed to be horizontal. The true 100-yr flood profile was defined by the locus of points of the intersections of tidal and freshwater flood profiles of which the sum of their probabilities equals 1%. As an alternate solution, tidal and freshwater stage-frequency curves were generated at desired locations. The true probability of exceedance of the combined tidal and freshwater flood events for a stated flood elevation was computed as the sum of the separate probabilities minus the product of the separate probabilities. It is interesting to note that the backwater curve produced by simultaneous occurrence of tidal and freshwater floods is similar in form to the curve produced by combined probabilities of the tidal and freshwater events. (Humphreys-ISWS)
W78-09204

SUSPENDED SEDIMENT DISCHARGE OF THE SUSQUEHANNA RIVER TO NORTHERN CHESAPEAKE BAY, 1966 TO 1976,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2J.
W78-09208

RECENT AND PLANNED MARSH ESTABLISHMENT WORK THROUGHOUT THE CONTIGUOUS UNTED STATES-A SURVEY AND BASIC GUIDELINES,
Environmental Concern, Inc., St. Michaels, MD.
For primary bibliographic entry see Field 2I.
W78-09217

REGULATION OF HARBORS AND PONDS OF MARTHA'S VINEYARD,
Woods Hole Oceanographic Institution, MA. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 6E.
W78-09222

ESTIMATION OF POND EVAPORATION IN THE GEORGIA COASTAL PLAIN,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-09224

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
For primary bibliographic entry see Field 5B.
W78-09225

NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH,
Woods Hole Oceanographic Institution, Woods Hole, MA.
For primary bibliographic entry see Field 5C.
W78-09274

LONG-TERM EFFECTS OF AN OIL SPILL ON FUCUS MACROFAUNA IN A SMALL BALTIC BAY,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
For primary bibliographic entry see Field 5C.
W78-09275

OBSERVATION OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-09276

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-09277

BENTHIC HYDROCARBONS OF RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-09279

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLOFJORD,
For primary bibliographic entry see Field 5C.
W78-09281

EFFECTS OF THE ORGANOPHOSPHORUS INSECTICIDES TEMEPHOS (ABATE) AND CHLORPYRIFOS (DURSBAN) ON POPULATIONS OF THE SALT-MARSHES MELAMPUS BIDENTATUS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W78-09285

DINOFLAGELLATE TOXINS AS PROBABLE CAUSE OF AN ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) KILL, AND PTEROPODS AS APPARENT VECTOR,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5B.
W78-09288

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

SOVIET DEVELOPMENTS IN WEATHER MODIFICATION, CLIMATE MODIFICATION, AND CLIMATOLOGY,
Informatics, Inc., Rockville, MD.
G. S. Gordon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 675, Price codes: A05 in paper copy, A01 in microfiche. September 1975. 89 p, 29 fig, 2 tab, 62 ref. DARPA MDA-903-76C-0099.

This report focused on Soviet developments in weather modification, climate modification, and climatology during the period from late 1973 through mid-1975. Current Soviet work in solar meteorology and laser applications in atmospheric sounding also were surveyed. The source literature included regular Soviet scientific journals, recent monographs, popular science periodicals, and the daily press. (Sims-ISWS)
W78-09214

ESTIMATION OF POND EVAPORATION IN THE GEORGIA COASTAL PLAIN,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-09224

ECONOMIC BENEFITS OF CLIMATOLOGICAL SERVICES,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 6B.
W78-09226

3C. Use Of Water Of Impaired Quality

OUR SALTY RIVERS: LEGAL AND INSTITUTIONAL APPROACHES TO SALINITY MANAGEMENT,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-08973

3D. Conservation In Domestic and Municipal Use

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-08952

REGIONAL GOVERNMENTAL ARRANGEMENTS IN METROPOLITAN AREAS: NINE CASE STUDIES,
Institute for Community Studies, Kansas City, MO.
For primary bibliographic entry see Field 6E.
W78-09069

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
For primary bibliographic entry see Field 6B.
W78-09247

WATER SUPPLY CATCHMENT POLICIES AND STUDIES FOR METROPOLITAN MELBOURNE,
For primary bibliographic entry see Field 6B.
W78-09250

3E. Conservation In Industry

EFFECT OF PROCESS MODIFICATIONS ON THE REDUCTION OF WATER USE AND WASTE IN A CASE STUDY DAIRY PLANT,
Ohio State Univ., Columbus.
R. E. Carawan.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No 780 5820. PhD Thesis, 1977. 394 p.

Descriptors: *Dairy industry, *Food processing industry, *Analytical techniques, *Model studies, *Optimization, Cost analysis, Design criteria, Biochemical oxygen demand, Computer programs, Industrial wastes.

Modification at a multi-product dairy plant were developed for cost-effective operation and water and waste reductions. A linear economic model was derived to compare alternative processes on the basis of increased cost, effluent quality standards, and selected process alternatives. The implementation of 21 process alterations provided a 50% reduction in water consumption and waste load, resulting in the conservation of 72.4 million gal of water/yr at a net savings of $921,000. A linear economic analysis model, based on water use, effluent surcharge, and waste restriction costs, identified optimum operational efficiency processes, least cost operation, marginal restriction costs, and activity of the parameters within

the specific plant configuration. The solution to the linear model demonstrated the impact of BOD and other waste parameters on plant processes, such as milk, ice cream, and cottage cheese production, which would be severely restricted by high waste water surcharges. With an effluent restriction of 2,000 mg/liter BOD and implementation of available process alternatives, the plant attained optimum production capacities. (Lisk-FIRL)
W78-08890

A FORMAT FOR PLANNING A COMMECIAL MODEL AQUACULTURE FACILITY,
Kramer, Chin and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-09228

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA, (PHASE I).
Mathematical Sciences Northwest, Inc., Bellevue, WA.; and Human Resources Planning Inst., Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-09229

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-09241

3F. Conservation In Agriculture

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
For primary bibliographic entry see Field 6B.
W78-08916

IRRIGATION COSTS, WHICH METHOD IS BEST FOR YOU.
Water and Irrigation, p 12-13, 24-25, November, 1977. 3 fig, 2 tab.

Descriptors: Irrigation systems, *Irrigation practices, Economics, Cost analysis, *Cost comparisons, *Costs, Furrow irrigation, Sprinkler irrigation, Surface irrigation, California.

One of the most persistent questions in the minds of farmers who are considering changing their method of irrigation, is 'What will it cost.' The Cooperative Extension Service of the University of California assigned several of its experts to provide a perspective on irrigation costs in California. (Skogerboe-Colorado State)
W78-08917

DRIP IRRIGATION MANAGEMENT,
Agricultural Research Service, Riverside, CA.
S. Davis.
Water and Irrigation, p 14-15, 29-30, November, 1977. 2 fig.

Descriptors: Irrigation, Irrigation systems, Irrigation practices, *Irrigation efficiency, *Drip irrigation, *Water management(Applied).

Management is unquestionably the most important factor in the use of drip irrigation. To be successful and to accomplish its purpose, drip irrigation requires sound decisions on the part of designers, installers and operators. If the proper equipment is not selected for the soil and water conditions and the equipment installed and operated as designed, then drip irrigation will not fulfill its full capacity to most efficiently utilize energy and water. (Skogerboe-Colorado State)
W78-08918

DRIP/TRICKLE IRRIGATION SCHEDULING,
Superior Farming Co., Bakersfield, CA. Dept. of Irrigation Engineering.
R. Rodriguez.
Water and Irrigation, p 21-26. November, 1977. 1 tab.

Descriptors: Irrigation, *Irrigation practices, Irrigation efficiency, Irrigation methods, Soil moisture, Evapotranspiration, *Drip irrigation, *Trickle irrigation.

The preliminary results obtained so far have been plotted. The applied water, crop evapotranspiration (ET) and the soil moisture content are plotted against time. Applied water and ET are plotted in inches per week, every week. The moisture content (as measured with the neutron probe) is shown in inches of water per foot of soil. (Skogerboe-Colorado State)
W78-08919

CENTER PIVOT WITH DROP OUTLETS DIRECTS WATER TO ROOT ZONE,
N. Rodgers.
Irrigation Age, Vol. 11, No. 5, p 36-37, 39, February, 1977. 2 fig.

Descriptors: *Irrigation efficiency, Water conservation, Irrigation methods, *Irrigation practices, Surface irrigation, Evaporation, *Root zone.

The use of a pivot sprinkler now on loan to the Texas Agricultural Experiment Station (TAES) could revolutionize sprinkler systems where evaporation losses are high due to wind velocity. The newest idea in center pivot irrigation and an old idea called furrow diking to hold rainfall have been combined at the TAES in Lubbock. The melding of the latest idea in irrigation and the holdover damming practice from the dust bowl days is a totally new way to get maximum returns out of a limited amount of water. (Skogerboe-Colorado State)
W78-08920

STRAIGHT SHOT HERBIGATION,
NEBCO Corp., Holyoke, CO.
G. Welsh.
Irrigation Age, Vol. 11, No. 5, p 46, February, 1977. 2 fig.

Descriptors: *Herbicides, Sprinkler irrigation, *Colorado, *Irrigation practices, Crop production, Corn(Field).

Direct injection of a herbicide through sprinklers has not been attempted on a large scale in Colorado. At least not until last year when Gene Welsh, Manager of NEBCO Corporation in Holyoke, applied straight Sutan+ with atrazine through center pivots on several circles of corn. Most growers who herbigate corn dilute the chemical in a holding tank before injecting it into the sprinkler. Because herbicides require small amounts of chemical per acre, many farmers claim it is too difficult to accurately inject the proper rates in this manner, so they blend it with large batches of water before injection. This popular method has proved to be effective but according to Welsh, who has used both methods, 'It's definitely easier to inject the straight herbicide. It's a trouble-free process and calibration is much simpler.' (Skogerboe-Colorado State)
W78-08921

YIELDS AND NUTRIENT ACCUMULATION BY DETERMINATE SOYBEANS, AS AFFECTED BY APPLIED NUTRIENTS,
National Fertilizer Development Center, Muscle Shoals, AL.
G. L. Terman.
Agronomy Journal, Vol. 69, No. 2, p 234-238, March-April 1977. 2 fig, 5 tab, 12 ref.

Descriptors: Fertilizers, *Fertilization, *Soybeans, *Nutrients, Crop response, *Crop production.

Most published results with southern determinate soybeans are concerned with only a single fertilizer treatment and/or one or two sampling dates. Consequently, field experiments were conducted to determine effects of applied N and K on dry matter yields, nutrient concentrations, and nutrient uptake at several sampling dates and on final grain yields. Rates of 0, 86, and 172 kg of applied K/ha and 0 and 70 kg of N were compared in a field experiment on Sango sil in 1973 and K rates of 0, 75, and 150 kg/ha in 1974. Marked responses to applied K were obtained. Maximum dry matter yields and nutrient uptake occurred during the early pod filling stage of growth. Dry matter yields then declined as a result of greater loss of leaf and petiole drop than of increase in grain filling. Concentrations of K in leaves, topgrowth, and grain increased with amount of applied K, but top trifoliate leaf blade concentrations were lower than some published recommended levels for high yields. Marked reciprocal relationships occurred among concentrations of K and Ca or Mg in top trifoliate leaves and topgrowth. Several combinations of N, P, K, and S foliar- and soil-applied during pod filling were also compared in a 1976 pot experiment on Sango sil. Grain yields and concentrations of each applied nutrient were increased in leaves and grain. Pod numbers were highly correlated with grain yields. (Skogerboe-Colorado State)
W78-08922

INFLUENCE OF THREE SOIL-WATER REGIMES ON ROOT POROSITY AND GROWTH OF FOUR RICE VARIETIES,
National Bureau of Soil Survey and Land Use Planning, New Delhi (India).
D. K. Das, and R. L. Jat.
Agronomy Journal, Vol. 69, No. 2, p 197-200, March-April 1977. 4 fig, 2 tab, 20 ref.

Descriptors: Soil moisture, Soil water, Root systems, *Root development, *Rice, Saturated soils, *Crop production.

A better understanding of the growth response of rice to waterlogged soil conditions is desirable. The objective of this study was to measure the influence of soil water regime on root porosity, growth, and nutrient content of four varieties of rice at various dates after transplanting. Four rice varieties were grown under three soil water regimes (continuous flooding, alternate flooding, and no flooding) in a greenhouse on a clay loam soil. Root porosity, growth of plants and nutrient (N, P, K, Ca, and Mg) content of shoots were determined at four different plant ages (30, 60, 85, and 110 days after transplanting). Root porosity was greatest in plants grown with continuously flooding. Porosity of roots in all four varieties reached maximum values between 30 and 60 days and then started to decline. Padma and BC6 had higher root porosities than IR8 and IR22. High root porosity was associated with greater root length, increased dry weight of roots and shoots, and higher nutrient content in shoots. (Skogerboe-Colorado State)
W78-08923

PREDICTION OF LATE SEASON NITRATE-NITROGEN CONTENT OF SUGARBEET PETIOLES,
South Dakota State Univ., Redfield. James Valley Research and Extension Center.
J. F. Giles, A. E. Ludwick, and J. O. Reuss.
Agronomy Journal, Vol 69, No 1, p 85-88, January-February 1977. 6 fig, 1 tab, 8 ref.

Descriptors: *Nitrates, *Nitrogen, *Sugarbeets, Nutrients, Fertilizers, Fertilization, Colorado, Forecasting.

Nitrate nitrogen levels in sugarbeet petioles have been used as an aid to diagnose nutritional status of the plants. The purpose of this study was to evaluate a theoretical approach to the prediction of the rate of change in N03(-)N concentration of sugarbeet petiles. petiole samples were collected from sugarbeet N fertilizer trials conducted over a 2-year period on cooperator farm sites in central and eastern Colorado. Results showed the N03(-) N concentration of sugarbeet petioles through the growing season decreased exponentially. The rate of change was a function of soil N03(-) content (0-120 cm depth) measured in the spring and the amount of N applied as preplant fertilizer. Calculation of the rate of change with this function and the measurement of one early petiole sample enables the prediction of the N03(-) N concentration during the remainder of the growing season. (Skogerboe-Colorado State)
W78-08925

FIELD-MEASURED WATER UPTAKE OF SUDANGRASS ROOTS AS AFFECTED BY FERTILIZATION,
California Univ., Riverside.
H. Fluhler, M. S. Ardakani, T. E. Szuszkiewicz, and L. H. Stolzy.
Agronomy Journal, Vol 69, No 2, p 269-274, March-April 1977. 8 fig, 23 ref.

Descriptors: Fertilizers, *Fertilization, Groundwater, *Nitrates, Leaching, *Roots, Evapotranspiration, Groundwater resources, Water quality control, *Sudangrass, *Absorption.

Cultural practices could affect the flow of water and solutes toward groundwater. In this field experiment we analyzed the effect of fertilization on water uptake of sudangrass and its indirect influence on deep drainage and nitrate leaching. Root water uptake was calculated as sink term in the continuity equation using successive measurements of water content and matric potential profiles in connection with field measured hydraulic conductivity fuctions. The experiment was conducted in three field plots on Hanford fine sandy loam. Fertilization increased dry matter production and water uptake significantly and reduced deep drainage and nitrate leaching. Water uptake patterns and root length distribution was not correlated. Mainly due to fertilization with nitrate nitrogen, the evapotranspiration approximated the amount of irrigation water applied. These results indicate that optimum water and fertilizer use and minimum groundwater pollution per unit crop production are intimately linked together. (Skogerboe-Colorado State)
W78-08926

SEASONAL ANHYDROUS AMMONIA COMPARISON FOR CORN WITH AND WITHOUT A NITRIFICATION INHIBITOR,
Georgia Univ., Experiment. Dept. of Agronomy.
F. C. Boswell.
Agronomy Journal, Vol 69, No 1, p 103-106, January-February 1977. 6 tab, 21 ref.

Descriptors: *Ammonia, *Corn(Field), *Nitrification, *Nitrogen, Crop production, Leaching, Denitrification, Inhibitors.

With increased interest in 'off-season' N application and emphasis on better management of N with respect to environmental pollution and economic considerations, information is needed relative to seasonal anhydrous ammonia comparisons for corn with and without an inhibitor. Field studies compared rates of N applied preplant with December application either with or without the nitrification inhibitor did not affect yield, number of ears, average ear weight, and percent N, P, K, Ca, and Mg in the tissue or concentrations of various other elements in tissue sampled early in the growing season, at early silking, or in corn grain. Both low (90 kg/ha) and high (180 kg/ha) N levels increased yields above check plots (zero N) when applied in December for the three-year average but both levels were significantly less than the high N level applied preplant. (Skogerboe-Colorado State)
W78-08927

METABOLISM OF ORGANOPHOSPHORUS COMPOUNDS IN SOYBEAN PLANTS IN FLOODED SOIL (IN RUSSIAN),
Far Eastern Univ., Vladivostok (USSR).
For primary bibliographic entry see Field 2I.
W78-08966

CORN-SOYBEAN TILLAGE SYSTEMS: EROSION CONTROL, EFFECTS ON CROP PRODUCTION, COSTS,
Illinois Univ. at Urbana-Champaign, Dept. of Agricultural Engineering.
J. C. Siemens, and W. R. Oschwald.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 2, p 293-302, March-April 1978. 1 fig, 23 tab, 12 ref.

Descriptors: *Erosion control, *Farm management, *Crop production, *Costs, On-site investigations, Erosion, Soil erosion, Vegetation effects, Infiltration, Runoff, Simulated rainfall, Herbicides, Corn(Field), Soybeans, Crops, Agriculture, *Tillage, Tillage systems, Tillage practice.

Seven tillage systems for producing corn and soybeans were compared in terms of erosion control, effects on production, and cost. The systems were fall moldboard plow and six conservation tillage systems, spring moldboard plow, disk-chisel, coulter-chisel, chisel, disk, and plant. Conservation tillage systems greatly reduced soil loss caused by simulated rain. Yields tended to be lower with conservation tillage. Total costs for the different systems were equivalent. The lower soil loss resulting from conservation tillage is so important that a continued effort must be made to overcome the detriments so that the practice is acceptable to most farmers. (Sims-ISWS)
W78-09048

A DEVICE FOR THE IRRIGATION OF SOIL COLUMNS (IN GERMAN),
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldernaehrung.
For primary bibliographic entry see Field 2G.
W78-09109

FLOW FROM A LINE SOURCE ABOVE A SHALLOW WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. W. Warrick, and D. O. Lomen.
Soil Science Society of America Journal, Vol. 41, No. 5, p 849-852, September-October 1977. 3 fig, 1 tab, 8 ref.

Descriptors: Irrigation, Irrigation practices, *Irrigation systems, *Subsurface irrigation, Hydraulic conductivity, Soil water, *Soil water movement, Porous media, *Trickle irrigation, Flow, Water table, Matrix flux potential.

An analytical solution is developed for a buried line source with an underlying constant potential surface. The geometry is appropriate to describe flow from a trickle or subsurface irrigation system of porous pipe or emitters spaced closely in a line above a shallow water table or in a lysimeter. Assumptions include steady-state conditions and a hydraulic conductivity exponentially related to the pressure head. The soil water pressure head distribution is calculated for two geometries, one for which the water table dominates over the line source throughout the flow medium, and a second for which most of the flow region is as if the source were above an infinitely deep lower boundary. (Skogerboe-Colorado State)
W78-09112

THE SHEAR RESISTANCE OF ROOT-PERMEATED HOMOGENEOUS AND STRATIFIED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W78-09113

UNIFORM IRRIGATION WITH A LOW-HEAD BUBBLER SYSTEM,
Agricultural Research Service, Riverside, CA. Salinity Lab.
S. L. Rawlins.
Agricultural Water Management, Vol 1, No 2, p 167-178, September 1977. 8 fig, 1 tab, 3 ref.

Descriptors: Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Gravitational water, Irrigation engineering, Hydraulics, *Distribution systems.

Existing closed-conduit irrigation systems are capable of saving water by increasing application uniformity. But, because most of them require pumping to pressurize water for distribution, the water is saved often at the expense of increased energy consumption. A new irrigation system is described that reduces the energy requirement by using inexpensive, thin-walled, corrugated plastic pipe of sufficient diameter that the pressure head often available from a surface ditch is sufficient. A simple installation technique, giving extremely high application uniformity, is described for the system for permanent crops. Costs for the system can be less than for comparable sprinkler or drip irrigation systems. (Skogerboe-Colorado State)
W78-09115

VIAFLO, A REVOLUTIONARY IRRIGATION SYSTEM (IN SPANISH),
Universidad del Norte Arica (Chile). Dept. of Agriculture.
J. Acuna Gonzalez.
Idesia Vol 4, p 157-158, 1976.

Descriptors: *Crops, Irrigation system, Surface irrigation, *Plastic pipes, Beans, Infiltration, Irrigation, Viaflo.

The system involves the extension of a porous plastic hose between rows of crops. It allows irrigation by infiltration, with minimum water waste. Functioning is briefly explained and the advantages of the system in raising bean crops in arid climates are discussed as an example.--Copyright 1977, Biological Abstracts, Inc.
W78-09116

THE USE OF LONG-THROATED FLUMES TO MEASURE FLOWS IN IRRIGATION AND DRAINAGE CANALS,
International Inst. for Land Reclamation and Improvement, Wageningen, (Netherlands).
M. G. Bos.
Agricultural Water Management, Vol 1, No 2, p 111-126, September 1977. 7 fig, 2 tab, 9 ref.

Descriptors: *Water measurement, *Flow measurement, Measurement, Flumes, Flow rates, Hydraulics, Irrigation water, Weirs, Canals.

Presented is a set of easy-to-use formulae that give an accurate head-discharge relationship for long-throated flumes with a prismatic throat cross-section. The method by which the formula have been derived is the same for all long-throated flumes, regardless of the shape of their throat cross-sections. As a result, the value of the discharge coefficient is independent of this shape and is a function of the ratio of the upstream energy head over the flume to the flow-wise length of the throat. The formula and coefficient values also apply to brad-crested weirs with rounded upstream nose. (Skogerboe-Colorado State)
W78-09117

PORTLAND CEMENT AS A SOIL AMENDMENT FOR CORN AND SOYBEANS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
R. K. Stivers, D. Swartzendruber, and W. E. Nyquist.
Agronomy Journal, Vol 69, No 6, p 961-964, November-December 1977. 3 tab, 7 ref.

Descriptors: *Corn(Field), *Soybeans, *Soil ammendment, Soil water, Hydraulic conductivity, Infiltration, Soil properties, Soil physical properties, Soil treatment, Soil water movement, *Cements, Soil aggregates, Crop yield.

In the corn belt there are many areas of imperfectly drained soils, often adjacent to well-drained soils in the same fields. Tile drainage of these imperfectly drained soils helps remove excess water within the profile. Slow movement of water into and through the Ap horizon of these soils is thought to contribute to reduced crop yields in wet years. Since application of Portland cement (the binding material in concrete) to soil in a laboratory experiment increased water-stable soil aggregate size as well as hydraulic conductivity of a soil, it was assumed that cement would act similarly in the field and increase crop yields, particularly under wet conditions. Cement did have a significant effect on grain yield in all cases. (Skogerboe-Colorado State)
W78-09118

RESPONSE OF LEAF WATER POTENTIAL TO PRESSURE CHANGES AT THE ROOT SURFACE OF CORN PLANTS,
Guelph Univ. (Ontario). Dept. of Land Resources Science.
For primary bibliographic entry see Field 2I.
W78-09119

UPTAKE AND LOSSES OF 15N APPLIED TO ANNUAL GRASS AND CLOVER IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 5B.
W78-09120

CLOVER N-FIXATION MEASUREMENT BY TOTAL-N DIFFERENCE AND 15N A-VALUES IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 7B.
W78-09121

SHORT TERM SPRINKLER PATTERNS BY DYE-CONCENTRATION METHOD,
Idaho Univ., Aberdeen. Dept. of Agricultural Engineering.
G. M. McMaster.
Paper No. 77-2566 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 5 p, 2 fig, 6 ref.

Descriptors: Sampling, Sprinklers, *Sprinkler irrigation, Irrigation, *Irrigation effects, Irrigation efficiency, *Dyes, Measurement, Fluorometer, Dye releases, *Dye dispersion.

A procedure was tested to determine the sprinkler head pattern resulting from a few revolutions of the head. A fluorescent dye, detectable at low concentration in water, was injected upstream from a sprinkler head. Precipitation collectors were charged with a measured volume of water. The precipitation rate on each collector was determined by measuring dye concentration with a flourometer. Tests of several time durations were conducted and compared. (Skogerboe-Colorado State)
W78-09123

ANALYSIS OF THE DIMENSIONLESS LINEAR CUMULATIVE FREQUENCY DISTRIBUTION OF WATER DEPTHS UNDER SPRINKLER IRRIGATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
D. Karmeli, and G. Peri.
Paper No. 77-2567 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 36 p, 12 fig, 2 tab, 4 ref.

Descriptors: *Sprinkler irrigation, Irrigation, *Model studies, Irrigation efficiency, irrigation effects, *Distribution patterns, *Regression analysis, Depth.

The linear regression model is used to describe sprinkler distribution patterns. The linear fit is found to approximate the distribution very well in a wide range of experimental data. The use of the model allows for additional information regarding irrigation quality parameters. Associated with the linear regression, a new coefficient, UCL, is suggested for practical use. (Skogerboe-Colorado State)
W78-09124

DIGITAL ELECTRONIC MEASUREMENT AND RECORDING OF IRRIGATION FIELD WATER DEPTHS,
ICE Corp., Manhattan, KS.
W. H. Dawes, M. R. Casey, J. D. Scharplaz, and H. L. Manges.
Paper No 77-2577 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 3 p, 1 fig.

Descriptors: *Furrow irrigation, Water table, Sampling, *Irrigation practices, Irrigation effects, *Measurement, Depth.

A system is described for measuring water depths at twelve locations in a three-furrow irrigation field with capacitance type level sensors. The data from the sensors are recorded on a cassette tape at one or five minute intervals. The system is battery operated. Methods for retrieving data from a cassette tape are discussed. (Skogerboe-Colorado State)
W78-09125

ALLOCATION PROCEDURE OF FARM RESOURCES IN RELATION TO SOME IRRIGATION QUALITY PARAMETERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
D. Karmeli.
Paper No. 77-2018 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, North Carolina State University, 15 p, 1 fig, 3 tab, 5 ref.

Descriptors: Crop production, Agriculture, Irrigation, Irrigation effects, *Irrigation systems, *Irrigation efficiency, *Water allocation.

Land, water, labor and capital are optimally allocated to crops on a farm, using a procedure that also relates to irrigation frequency and level of improvement in the irrigation system. The procedure is based on formulating outputs and expenditures as well as the functions of irrigation frequency--water and yield. The Generalized Geometric Programming is used to solve the objective function as nonlinear equations are involved. (Skogerboe-Colorado State)
W78-09126

COMPUTERIZED DESIGN AND ANALYSIS OF SPRINKLER IRRIGATION SYSTEMS,
Maine Univ. at Orono. Dept. of Agricultural Engineering.
W. E. Hedstrom, and D. P. Bevilacqua.
Paper No 77-2568 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago Illinois, 13 p, 9 ref.

Descriptors: *Sprinkler irrigation, Irrigation, *Irrigation design, *Computer programs, Economics, Hydraulics, Hydraulic design.

The elements of the sprinkler irrigation design procedure which may be computerized are discussed. These include hydraulic analysis, application rate analysis, and an economic analysis as well as other applications. The conditions under which use of the computer is most worthwhile include design of solid-set systems on irregularly-shaped, steep fields. (Skogerboe-Colorado State)
W78-09127

MANAGEMENT OF IRRIGATION STREAM SIZE FOR IMPROVED RUNOFF WATER QUALITY,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-09128

CANAL SEEPAGE REDUCTION BY SEDIMENT LADEN WATER,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4A.
W78-09129

FACTORS AFFECTING WATER DISTRIBUTION AFTER UNIFORM IRRIGATION,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-09130

A LYSIMETER SYSTEM FOR WATER TABLE CONTROL,
Agricultural Research and Education Center, Belle Glade, FL.
S. F. Shih, G. J. Gascho, and J. W. Mishoe.
Paper No. 77-2575 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 12 p, 4 fig, 2 tab, 13 ref.

Descriptors: *Lysimeters, *Water table, *Sugarcane, *Irrigation, Irrigation effects, Crop production.

Lysimeters were constructed from plastic-lined, above-ground swimming pools in order to control water tables at 30, 60 and 90 cm below the surface of muck soil for sugarcane culture. Details of the construction and water table maintenance data are included. The water tables were well maintained for a low installation cost of about $20/sq m of soil surface area. (Skogerboe-Colorado State)
W78-09131

EFFECT OF DRAIN DIAMETER, OPENINGS AND ENVELOPS ON WATER TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-09132

BENEFITS OF SURFACE DRAINAGE,
Arkansas Cooperative Extension Service, Little Rock.
For primary bibliographic entry see Field 4A.
W78-09133

NITROGEN RESPONSES OF TALL FESCUE AND RYEGRASS SURVIVOR POPULATIONS FROM A RATE-OF-NITROGEN EXPERIMENT,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
W. Harris, and A. Lazenby.
New Zealand Journal of Agricultural Research, Vol. 20, No. 3, p 327-330, August, 1977. 2 tab, 8 ref.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, Nutrients, Crop production, Crop response, *Grasses, *Ryegrass, *Fescues.

Survivor populations of ryegrass and tall fescue from an experiment in which nitrogen was applied at rates of 0 to 1344 kg/ha/year were tested for nitrogen response in the range from 0 to 4352 kg N/ha in a single application. Applications above 544 kg N were supra-optimal and were totaly toxic at 4352 kg N. There were no indications of adaptation of the different survivor populations to either sub-optimal or supra-optimal levels of nitrogen. (Skogerboe-Colorado State)
W78-09134

THE BRIGHT SIDE OF LOW PRESSURE.
Irrigation Age, Vol 11, No 4, p 52, January, 1977, 1 fig.

Descriptors: *Sprinkler irrigation, Irrigation, Energy, Economics, Sprinklers, *Nozzles, Pressure.

The benefits of low pressure nozzles for sprinkler irrigation are described. (Skogerboe-Colorado State)
W78-09135

MORE GROWERS TURN TO HERBIGATION FOR WEED CONTROL.
Irrigation Age, Vol 11, No 4, p 47-48, January, 1977. 2 fig, 1 tab.

Descriptors: Herbigation, Weed control, Herbicides, Irrigation, Irrigation practices, Chemicals.

The beneficial effects of herbigation and equipment to accomplish herbigation are described. (Skogerboe-Colorado State)
W78-09136

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
For primary bibliographic entry see Field 4A.
W78-09138

IRRIGATION SCHEDULING WITH NEUTRON PROBE,
Bureau of Reclamation, Boulder City, NV.
R. D. Gear, A. S. Dransfield, and M. D. Campbell.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR 3, p 291-298, September 1977. 3 fig, 3 ref.

Descriptors: Irrigation, *Irrigation practices, Soil water, *Soil water, *Soil moisture, *Soil water movement, Soil properties.

A simple accurate technique has been worked out to schedule irrigations, using a graphic display of neutron probe measurements. The neutron probe design has been changed to combine the scaler with the shield and provide a useful field tool from what has traditionally been used almost exclusively for research. The technique used for scheduling irrigation requires only the identification of the refill point for each field and the neutron measured water content with time. (Skogerboe-Colorado State)
W78-09139

HYDRODYNAMICS OF BORDER IRRIGATION--COMPLETE MODEL,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
N. D. Katopodes, and T. Strelkoff.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR 3, p 309-324, September 1977. 5 fig, 1 tab, 6 ref.

Descriptors: *Border irrigation, Irrigation, *Irrigation practices, Irrigation systems, *Model studies, Simulation analysis, *Hydrodynamics, Irrigation engineering, Surface irrigation.

The phenomenon of surface irrigation from start to finish is modeled mathematically, using the method of characteristics. The solution, based on prescribed time increments, is correct to second order accuracy, and the iterative scheme had second-order rate of convergence. The cost and accuracy of the model were tested against existing field data and other models. Approximately 400 FORTRAN statements are required for the complete code. The processing time on a Burroughs 6700 digital computer ranges from 3 to 5 minutes for a complete irrigation. At $165/hr, this amounts to $10-15 per run. The aim of this work was a complete hydrodynamic model that can be trusted and operated by anyone at moderate expense. It is not intended for design or specific applications. (Skogerboe-Colorado State)
W78-09140

ECONOMIC IMPACT OF DIMINISHING GROUNDWATER RESERVES ON CORN PRODUCTION UNDER CENTER-PIVOT IRRIGATION,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
A. K. Sanghi, and R. Klepper.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 282-285, November-December, 1977. 4 tab, 18 ref.

Descriptors: Groundwater, *Groundwater resources, Groundwater basins, Groundwater potential, Aquifers, *Corn(Field), Sprinkler irrigation, *Irrigation, Nebraska, Crop response, Crop production, Water conservation, *Economic impact.

A method for analyzing the on-farm economic consequences of diminishing groundwater reserves was developed. The method uses two functions. One relates well yield to an aquifer's saturated thickness. The other is a yield-response function that recognizes a critical period of plant growth. The application of the method to corn under center-pivot irrigation in Holt County, Nebraska, showed net returns to be far more sensitive to insufficient irrigation water during the critical period of corn growth than to price increases for energy or other inputs. The analysis also suggested that farmers motivated by short-run economic gain will find it profitable to modify wells to sustain well yield as water tables decline. Conservation of groundwater, therefore, cannot be left to market forces. (Skogerboe-Colorado State)
W78-09142

IMPLICATIONS OF IRRIGATION SYSTEM EFFICIENCIES,
Agricultural Research Service, Fort Collins, CO.
E. G. Kruse, and D. F. Keermann.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 265-270, November-December, 1977. 32 ref.

Descriptors: Irrigation, *Irrigation efficiency, Irrigation water, *Irrigation systems, Irrigation engineering, Sprinkler irrigation, Surface irrigation, Furrow irrigation, Tailwater, Water quality, Water resources, Water shortage, Water supply, Water conservation.

Field or farm irrigation efficiencies vary greatly, depending on water supply, type of irrigation system, crop, soil, and especially the level of management provided by the irrigator. Sprinkler and trickle systems simplify some management decisions by virtue of their design, at the expense of higher capital costs. Both generally have higher application efficiencies than conventional surface systems. But surface irrigation, using tailwater return facilities or level-basin concepts, may also be efficient. Irrigation efficiency is more important today than ever before because of limited supplies of water and energy. Irrigators must look closely at attainable efficiencies of new or improved irrigation systems if they are pumping water, if their seasonal water supplies are only marginally adequate for crop needs, or if water lost from their systems degrades water quality for downstream users. There are situations, however, where gravity flow provides adequate water, and the quaity of surface and subsurface return flow equals that of the irrigation water supply. In these cases, use of water over an entire project or river basin is a more important consideration than irrigation efficiencies on individual farms. (Skogerboe-Colorado State)
W78-09143

LONG-TERM STRATEGIES FOR SUPPLYING NITROGEN TO CROPS,
Los Alamos Scientific Lab., NM.
V. P. Gutschick.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6700-MS, Price codes: A05 in paper copy, A01 in microfiche. Publication No. LA-6700-MS, May, 1977. 73 p, 136 ref, 3 append.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, *Crop production.

Raising food for present population requires nitrogenous fertilizers in addition to indirect management of the biosphere's nitrogen cycle. The Haber process for making the ammonia base of fertilizers is increasingly pressed by shortages of energy, while only minor improvements are still possible. The Haber process and 15 alternatives for increasing the nitrogen available to crops using less fossil energy is discussed. These alternatives span technology of fertilizer synthesis, farm management and technology, crop genetics, and market management. (Skogerboe-Colorado State)
W78-09144

IRRIGATION RETURN FLOW MODELING--A STATE OF THE ART,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-09147

SIMULATION OF NUTRIENT LOSSES FROM CROPLAND,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-09148

AGRONOMY ABSTRACTS, 1977 ANNUAL MEETINGS.
American Society of Agronomy, Madison, WI.
Published by Americay Society of Agronomy, Madison, Wisconsin, (1977).

Descriptors: *Bibliographies, *Abstracts, Model studies, Fertilization, Land use, Climatology, Environmental quality, *Crop production, Soil chemistry, Nutrients, *Soils, Soil water, Fertilizers, Soil physics.

This booklet contains over 1,000 abstracts of papers that was presented at the 1977 Annual Meetings of American Society of Agronomy, Crop

Science Society of America, and Soil Science Society of America, Los Angeles, California, November 13-18, 1977. (Skogerboe-Colorado State)
W78-09150

A TENSIOMETRIC CONTROL DEVICE FOR AUTOMATIC IRRIGATION (IN SLOVANIA),
B. Maticic.
Zb Bioteh Fak Univ Ljublij Kmetijstvo Vol 25, p 219-224, 1975.

Descriptors: *Sprinkler irrigation, Tensiometers, Soil water, Irrigation, Equipment, Sorption, Control.

The tensiometric control device makes possible automatic irrigation in connection with stationary sprinkler irrigation systems. It turns on the irrigation system according to the need-where there is a deficit of water in the soil. The device consists of a mercury type tensiometer and automatic elements-relays and contactor. The device can be used to turn off an electric pump of a stationary irrigation system or magnetic valve if the irrigation system is connected with a water supply system. Desorption characteristics of the soil should be known for proper adjustment of detector pins.
W78-09158

WATER PROBLEMS IN THE INDUS FOOD MACHINE,
Colorado State Univ., Fort Collins. Dept. of Economics.
S. H. Johnson, III, A. C. Early, and M. K. Lowdermilk.
Water Resources Bulletin, Vol. 13, No. 6, p 1253-1268, December 1977. 17 tab, 16 ref.

Descriptors: *Water management(Applied), *Irrigation efficiency, *Farms, *Indus Basin(Pakistan), *Developing countries, Agriculture, Constraints, Water allocation(Policy), *Food production, Crops, Socio-economic aspects, Technical aspects.

Examples are drawn from the Indus Basin to explain why on-farm water management problems restrict the output of agricultural products in many developing countries (LDC's). Data is presented to illustrate the low level of water management knowledge of both the farmers and the current extension agents. Examples of the level of corruption and its effect on the operating system are presented. Several requirements that must be met before a large-scale irrigation scheme will actually increase welfare of LDC's farmers are given. It is concluded that the combination of lack of knowledge concerning irrigation practices and no government advice or assistance has resulted not only in some of the world's lowest yields, but also has salinized and waterlogged large areas of the Indus Basin. General recommendations that are practical and implementable are listed. (Graf-Cornell)
W78-09179

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 2G.
W78-09213

WATER TABLE DEPTH AND IRRIGATION EFFECTS ON WATER USE EFFICIENCIES OF THREE CROPS,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
L. C. Benz, G. A. Reichman, E. J. Doering, and R. F. Follett.
Paper No. 77-2039 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 17 p, 7 fig, 3 tab, 14 ref.

Descriptors: Irrigation, Irrigation efficiency, *Corn(Field), *Sugarbeets, *Water table, *Irrigation effects, Irrigation practices, *Alfalfa.

Production and applied water-use efficiencies (AWUE) of corn, sugarbeets, and alfalfa from a 3-year field experiment at three water table depths and four irrigation rates were highest from the shallow water table treatment without irrigation. (Skogerboe-Colorado State)
W78-09260

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Agricultural Research Service, Temple, TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W78-09264

A PROPOSED TECHNIQUE FOR TESTING AND EVALUATION OF HARDENED IRRIGATION DITCH CONCRETE,
Darco Engineering International, El Centro, CA.
For primary bibliographic entry see Field 8G.
W78-09265

SIMULATING THE RESPONSE OF CORN TO IRRIGATION IN HUMID AREAS,
Kentucky Univ., Lexington. Dept. oof Agricultural Engineering.
B. J. Barfield, W. G. Duncan, and C. T. Haan.
Paper No. 77-2005 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 23 p, 5 fig, 1 tab, 21 ref, 1 append.

Descriptors: *Simulation analysis, *Model studies, *Corn(Field), Irrigation, *Irrigation effects, Tropic regions, *Duncan model.

The Duncan Model for simulating the growth and yield of corn is described. The accuracy of the model for predicting yields of irrigated and nonirrigated corn is evaluated using 12 plot years of data. (Skogerboe-Colorado State)
W78-09266

COMPUTERIZED IRRIGATION SCHEDULING USING NEUTRON PROBES,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
J. F. Buchheim, and L. F. Ploss.
Paper No. 77-2004 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 12 p, 5 fig, 3 ref, 6 equ.

Descriptors: *Scheduling(Irrigation), *Soil moisture, Soil water, *Computer programs, Irrigation, Irrigation practices, *Neutron probes.

The development and evaluation of computer-supported irrigation scheduling are discussed. The use of neutron probes is being initiated in several areas to enhance the scheduling procedure. The results of one year of operation using these procedures in many areas including an analysis on an irrigation district confirmed the practical use of neutron probes. (Skogerboe-Colorado State)
W78-09267

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
J. W. Gilliam, R. W. Skaggs, and S. B. Weed.
Paper No. 77-2030 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 16 p, 8 fig, 11 ref.

Descriptors: Drainage, *Nitrates, Agriculture, *Drainage effects, *Drainage water, Drainage systems, Nutrients, Nitrogen, *Control structures, Water quality control.

Flashboard riser type water level control structures were installed in four tile mains or outlet ditches at two locations. Under controlled drainage conditions, there was a large decrease in both nitrate and drainage water lost through the artificial drainage systems. The effect on nitrate ultimately entering surface waters, however, is believed to depend on soil type. (Skogerboe-Colorado State)
W78-09268

GROUNDWATER STORAGE RIGHTS IN THE WESTERN STATES,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-09269

LIMITED TILLAGE SAVES SOIL, WATER, AND ENERGY,
Southwestern Great Plains Research Center, Bushland, TX.
R. R. Allen, and D. W. Fryrear.
Paper No. 77-2029 presented at the 1977 Annual Meeting, American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 14 p, 6 tab, 22 ref.

Descriptors: *Herbicides, Soil conservation, Erosion, Runoff, *Soil moisture, Soil water, *Agriculture, Mulching, Nebraska, *Crop production, *Cultivation, Texas, Great Plains, Kansas, Cotton.

Limited and higher cost energy since 1973 has added to the pressures upon agricultural production. How limited tillage can conserve energy as well as soil and water on the Great Plains is described. Stubble-mulch tillage, which began on the Great Plains for wind erosion control, was the forerunner of present limited tillage systems. Stubble-mulch reduced annual wind erosion from 6.5 to 2.0 metric tons/ha in western Nebraska and increased wheat production by 13 percent at Bushland, Texas, while using equal or less energy than clean tillage. Use of herbicides, or herbicides plus sweep tillage on fallow, increased soil water storage and reduced energy use in Kansas, Nebraska, and Texas. On sandy soils of the Southern Great Plains, crops such as cotton may not leave enough residue to prevent soil blowing. This may require additional energy to spread a mulch such as cotton gin trash or perform emergency surface-roughening tillage. With deep well irrigation of crops, energy for tillage is overshadowed by energy to pump water and manufacture fertilizer. Pumping and fertilizer energy can be 10 to 25 times higher than for tillage. (Skogerboe-Colorado State)
W78-09272

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MODIFIED PROPORTIONAL V-NOTCH WEIRS,
Indian Inst. of Science, Bangalore (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08810

RECONSTRUCTION OF RIVER DISCHARGES IN THE CONGO BASIN,
Moscow State Univ. (USSR). Dept. of Hydrology.
For primary bibliographic entry see Field 2E.
W78-08814

GENERATION OF ANNUAL STREAMFLOWS USING A FILTERED FRACTIONAL GAUSSIAN NOISE MODEL,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-08826

MARKOVIAN INPUTS AND THE HURST PHENOMENON,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-08827

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08836

ICE ON RIVERS AND LAKES--A BIBLIOGRAPHIC ESSAY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2C.
W78-08837

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08845

LOW-FLOW CHARACTERISTICS OF PENNSYLVANIA STREAMS,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08846

PRELIMINARY EVALUATION OF FLOOD FREQUENCY RELATIONS IN THE URBAN AREAS OF MEMPHIS, TENNESSEE,
Geological Survey, Memphis, TN. Water Resources Div.
C. W. Boning.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 310, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-132, 1977. 50 p, 25 fig, 5 tab, 10 ref.

Descriptors: *Flood frequency, *Flood recurrence interval, *Frequency analysis, *Regression analysis, *Rainfall-runoff relationships, Computer models, Analytical techniques, Urban hydrology, Tennessee, *Memphis area.

A storm-runoff relation for streams in the urban areas of Memphis, Tenn., was determined by a statistical evaluation of 59 flood discharges from 19 gaging stations. These flood discharges were related to drainage area, percent imperviousness of the drainage basin, and rainfall occurring over 120-minute periods. The defined relation was used to synthesize sets of annual flood peaks for drainage basins ranging from .05 square miles to 10 square miles and imperviousness ranging from 0 to 80 percent for the period of rainfall record at Memphis. From these series of flood peaks, frequency relations are presented for 2, 5, 10, 25, 50 and 100 year recurrent intervals. (Woodard-USGS)
W78-08850

MAUMEE RIVER BASIN LEVEL-B STUDY, WATER SUPPLY TECHNICAL PAPER,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08857

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
For primary bibliographic entry see Field 6B.
W78-08916

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-08955

STOCHASTIC MODELS OF FLOODS,
Montreal Univ. (Quebec) Ecole Polytechnique.
For primary bibliographic entry see Field 2E.
W78-09041

DISCHARGE-DEPTH EQUATION FOR SHALLOW FLOW,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-09045

WATER CONDITIONS IN CALIFORNIA, SUMMARY OF CENTRAL VALLEY WATER CONDITIONS, JUNE 1, 1978.
Sacramento Dept. of Water Resources, CA.
Special Summary, June 1, 1978. 5 p, 12 fig, 2 tab.

Descriptors: *California, *Water resources, *Data collections, Rivers, Lakes, Reservoirs, Runoff, Discharge(Water), Watersheds(Basins), Snow, Snow surveys, Moisture content, *Sacramento River Basin, *San Joaquin River Basin, *Tulane Lake Basin, *American River Basin, *Kern River Basin.

This special report summarized June 1 water conditions for Central Valley river basins. Several unusual factors made the 1977-78 winter and spring seasons unique. The precipitation season produced heavy rainfall, near record snow accumulation, and an irregular snowmelt period, all this following a two-year drought. The resulting patterns of water yield from the snow zones have complicated water supply forecasting but has aided water management activities this spring. Snow and related data, collected as of June 1, were presented to illustrate the effects of these unusual patterns and to define the current water supply conditions. Additional snow course and aerial depth marker measurements were made to define June 1 snow conditions. Reevaluation of streamflow forecasts, following the below-normal precipitation during May, resulted in reductions in volume forecasts for the April through July and water year periods. June 1 data shows that total runoff volumes for the April through July period will range from 132% of average in the Upper Sacramento River to 286% for the Kern River. Reservoir storage is about average on Sacramento Valley streams. (Humphreys-ISWS)
W78-09050

A DETERMINISTIC NON-LINEAR MODEL FOR RAINFALL-RUNOFF RELATION,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2A.
W78-09052

FEDERAL EVALUATION OF RESOURCE INVESTMENTS: A CASE STUDY,
Cornell Univ., Ithaca, NY. Water Resources and Marine Sciences Research Center.
For primary bibliographic entry see Field 6B.
W78-09062

FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME II, MORGAN COUNTY - WASHINGTON COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
Prepared for Morgan County-Washington County and Colorado Water Conservation Board, May 1977, 19 p, 27 plates, 7 tab.

Descriptors: *Flood flow, *Streamflow forecasting, *Flood forecasting, *Flood profiles, *Flood data, Floods, Indirect flood measurement, Historic floods, Flood recurrence interval, Flood stages, Stage-discharge relations, Peak discharge, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, *Colorado, *South Platte River(CO), Morgan County(CO), Washington County(CO), 100-year flood, 500-year flood.

The study area involves the portions of Morgan and Washington counties, Colorado, that are subject to flooding from the South Platte River. The flood plain consists primarily of agricultural land uses, with some residential and commercial development. Flood data were obtained from topographic maps, field studies, historic sources, and U.S. Geological Survey stream gage records from Morgan County. The main flood season occurs from May through September. Flooding results from heavy general rains, intense local thunderstorms, or snowmelt. The worst flood recorded at the gage at the Morgan-Washington County line occurred on June 18, 1965, discharging 123,000 cubic feet per second (cfs). At the same location, the 100-year flood would discharge 94,000 cfs and would crest at 4104 feet mean sea level (msl), while the 500-year flood would discharge 240,000 cfs and would crest at 4108 feet msl. Historic flood data and future flood projections are presented for the entire study area. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-09074

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, REDDING, CALIFORNIA.
Army Engineer District, Sacramento, CA.
Prepared for Shasta County, and City of Redding, CA, December 1975. 51 p, 23 fig, 9 plates, 7 tab.

Descriptors: *California, *Flood forecasting, *Flood profiles, *Flood data, Floods, Regional flood, Flood flow, Streamflow forecasting, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Building codes, Zoning, Control structures, Levees, Floodwalls, Dams, Reservoirs, Channel improvement, Redding(CA), *Sacramento River(CA), Shasta County(CA), Intermediate Regional Flood.

The study area involves the portions of the City of Redding and Shasta County, California that are subject to flooding from the Sacramento River.

Urban and residential land uses dominate the flood plain, although there is substantial agricultural development. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. Shasta Dam, a multi-purpose project first operated for flood control in 1943, provides some protection from rain and snowmelt floods originating in the Sacramento River Basin above Shasta Lake. Shasta County has adopted a flood plain regulation ordinance. The main flood season above Shasta Dam occurs from September through April and results from heavy general rainfall and some snowmelt. Below the dam, intense local thunderstorms cause flooding. Snowmelt runoff is contained by the dam. The worst flood recorded at Keswick Dam inflow occurred in January 1970, at the rate of 210,000 cubic feet per second (cfs). At the same location, the peak flow for the Intermediate Regional Flood would discharge 79,000 cfs and it would crest at 518 feet mean sea level (msl), while the peak flow for the Standard Project Flood (SPF) would be 308,000 cfs, and it would crest at 541 feet msl. Three bridges would obstruct the SPF flow. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. Guidelines for reducing flood damage are presented, including conventional methods such as dams, levees and floodwalls, channel improvements, and watershed treatment; and nonconventional methods such as zoning, building codes and subdivision ordinances, development policies, and warning systems. (Nessa-NC)
W78-09075

FLOOD PLAIN INFORMATION: TRINITY RIVER, LEWISTON LAKE TO JUNCTION CITY, TRINITY COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
Prepared for Trinity County, CA, April 1976, 26 p, 10 fig, 40 plates, 7 tab.

Descriptors: *California, *Flood forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Indirect flood measurement, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Control structures, Dams, *Trinity River(CA), Trinity County(CA), Lewiston Lake(CA), Intermediate Regional Flood.

The study area involves the flood plain of the Trinity River from Lewiston Lake to Junction City in Trinity County, California. The flood plain is primarily either forest or ranchland, although more resort areas are being developed. Flood data were obtained from topographic maps, historic sources, field studies, and stream gage records. The main flood season lasts from October through April and results from heavy general rainfall. Flooding upstream of Lewiston is partially controlled by dams. The worst flood of record occurred in December 1955, with an estimated peak discharge at the Lewiston gage of 71,600 cubic feet per second (cfs). However, the most damaging flood occurred in 1964, producing $10,000,000 in flood damages in Trinity County. The 1964 flood caused Trinity Lake to rise 35 feet. At Junction City above Canyon Creek, the Intermediate Regional Flood (IRF) is expected to discharge 46,000 cfs and would crest at 1460 feet mean sea level (msl), while the Standard Project Flood (SPF) would discharge 104,000 cfs and would crest at 1467 feet msl. Two bridges in the study area would be affected by the IRF and SPF. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-09076

AQUATIC WEEDS - ERADICATE OR CULTIVATE,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
R. P. Bates, and J. F. Hentges, Jr.
Economic Botany, Vol. 30, No. 1, p 39-50, January-March, 1976. 1 fig, 2 tab, 71 ref.

Descriptors: *Aquatic weeds, *Control, *Cultivation, Biocontrol, Aquatic plants, Water hyacinth, Foods, Products, Manatee, Human food.

Unless spectacular breakthroughs in biological control occur, control of aquatic weeds will involve a combination of mechanical and chemical methods and will incur considerable expense. Because aquatic weeds appear to be a stable component of tropical environment, it seems logical to use these plants to serve man and his environment. Foremost recent research efforts can be classed as: herbivorous marine culture, harvested aquatic weed products, and processed aquatic weeds for animal food. Promising research efforts have had too little time to yield spectacular solutions to the problem of aquatic weed infestation. (Stihler-Mass)
W78-09080

NUTRIENT LOSSES IN SURFACE RUNOFF FROM A NATIVE PRAIRIE,
Agricultural Research Service, Morris, MN. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2J.
W78-09110

THE USE OF LONG-THROATED FLUMES TO MEASURE FLOWS IN IRRIGATION AND DRAINAGE CANALS,
International Inst. for Land Reclamation and Improvement, Wageningen, (Netherlands).
For primary bibliographic entry see Field 3F.
W78-09117

CANAL SEEPAGE REDUCTION BY SEDIMENT LADEN WATER,
Nebraska Univ. Panhandle Station at Scottsbluff.
R. J. Edling.
Paper No. 77-2572 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977. Chicago, Illinois, 15 p, 3 fig, 3 tab, 4 ref.

Descriptors: *Seepage, *Canal seepage, Sediments, *Sediment load, Economics, Canals, Interstate Canal(North Platte River).

The influence of artificially induced sediment laden water on Interstate Canal seepage loss was studied. The Interstate Canal is the largest canal in the North Platte project. Substantial seepage loss reduction due to sediment laden water was realized in one of the four years studied. The practice of artificially inducing sediment laden water to reduce seepage loss is being threatened by environmental and economical concerns. (Skogerboe-Colorado State)
W78-09129

EFFECT OF DRAIN DIAMETER, OPENINGS AND ENVELOPS ON WATER TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-09132

BENEFITS OF SURFACE DRAINAGE,
Arkansas Cooperative Extension Service, Little Rock.
R. D. Estes, and W. S. Harris.
Paper No. 77-2587 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 3 p, 3 tab, 3 ref.

Descriptors: *Drainage, Drainage effects, Economics, Surface drainage, Operating costs.
Land was graded in approximately 40 ha. fields with a 40 ha. field left ungraded as a check. Records of operating costs and yields were kept for a three-year period. There was no appreciable difference in operating costs or yeilds. The difference was in management benefits. (Skogerboe-Colorado State)
W78-09133

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY 8, p 889-903, August 1977, 183 ref.

Descriptors: *Flow measurement, *Bibliographies, *Discharge measurement, Flow rates, Irrigation, Irrigation efficiency.

The ASCE Task Committee on Discharge Measurement charge relative to flow measurement included a review of techniques available, the encouragement of research in flow measurement, and the preparation of a final report. A review of the literature was made, resulting in the substantial bibliography which constitutes this report. (Skogerboe-Colorado State)
W78-09138

HYDRODYNAMICS OF BORDER IRRIGATION--COMPLETE MODEL,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 3F.
W78-09140

IMPLICATIONS OF IRRIGATION SYSTEM EFFICIENCIES,
Agricultural Research Service, Fort Collins, CO.
For primary bibliographic entry see Field 3F.
W78-09143

AQUATIC PLANTS: MANAGEMENT AND CONTROL,
Pennsylvania State Univ., University Park. Agricultural Extension Service.
For primary bibliographic entry see Field 5C.
W78-09154

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W78-09177

RECLAMATION OF OPEN-PIT QUARRIES FOR MULTIPLE USES,
Bissell and Karn, Inc., San Leandro, CA.
For primary bibliographic entry see Field 6F.
W78-09182

MAINTAINING WATER QUALITY IN VOYAGEURS NATIONAL PARK,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-09183

AN UNUSUAL CHALLENGE--AMERICAN RIVER PARKWAY,
Sacramento County Dept. of Parks and Recreation, CA.
For primary bibliographic entry see Field 6B.
W78-09184

RESTRAINTS ON WATER TRANSMISSION MAIN CONSTRUCTION,
Partner, Black and Veatch, Denver, CO.
For primary bibliographic entry see Field 8B.
W78-09187

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09188

THE VISTULA RIVER PROJECT,
For primary bibliographic entry see Field 6A.
W78-09189

SYSTEMS ANALYSIS BASIS OF WATER MANAGEMENT IN THE TISZA RIVER VALLEY,
National Water Authority, Budapest (Hungary). Water Resources Center.
For primary bibliographic entry see Field 6A.
W78-09190

AN OPTIMAL ADAPTIVE PREDICTION ALGORITHM FOR REAL TIME FORECASTING OF HYDROLOGIC TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09193

ALGORITHMS FOR THE STOCHASTIC INFLOW-NONLINEAR OBJECTIVE WATER RESERVOIR CONTROL PROBLEM,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09194

A FEATURE PREDICTION MODEL IN SYNTHETIC HYDROLOGY BASED ON CONCEPTS OF PATTERN RECOGNITION,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-09201

CHARACTERIZING LOW FLOWS USING THRESHOLD LEVELS,
Lehigh Univ., Bethlehem, PA. Fritz Engineering Lab.
For primary bibliographic entry see Field 2E.
W78-09202

PREDICTIONS OF HEAT AND MASS TRANSFER IN OPEN CHANNELS,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 5B.
W78-09203

TUBE DRAINAGE IN STRATIFIED SOIL ABOVE AN AQUIFER,
Iran Coll. of Science and Technology, Teheran.
M. Najamii, D. Kirkham, and M. D. Dougal.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR2, Proceedings Paper 13829, p 209-228, June 1978. 5 fig, 3 tab, 10 ref, 2 append. NSF ENG76-23598.

Descriptors: *Drainage, *Drainage systems, *Subsurface drains, *Model studies, Mathematical models, Tubes, Tiles, Tile drains, Soils, Stratification, Groundwater, Water table, Seepage, Drains, Artesian heads, Artesian aquifers, Drainage engineering, Irrigation, Potential flow, Drain spacing.

Potential flow theory was developed to give the relation of the drain spacing to the water table height midway between equally spaced tube drains in a two-layer stratified soil overlying an artesian aquifer under pressure. The tube drains, which are located in the upper layer, receive both steady downward recharge from the soil surface and upward seepage from the aquifer. The ratio of the drain spacing for a layered soil to the spacing for a homogeneous soil is 3.8 for these conditions: (1) the hydraulic conductivity ratio of the upper soil layer to the lower is 10; (2) the upper layer is 1/5 the combined thickness of the two; (3) the recharge is 0; (4) the ratio of the artesian head (measured with respect to the level of the drain tubes) to the desired maximum water table head above the drain centers is 2; and (5) the drain diameter is 0.02 times the combined thickness of the two layers. If the conductivity ratio is 100, for these conditions, the drain spacing ratio changes from 3.8 to 12.7, and if 1,000, to 41.1. (Sims-ISWS)
W78-09211

CALCULATING THE ICE DISCHARGE FRONT FOR DAMS,
For primary bibliographic entry see Field 2C.
W78-09220

REGULATION OF HARBORS AND PONDS OF MARTHA'S VINEYARD,
Woods Hole Oceanographic Institution, MA. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 6E.
W78-09222

'VOGTIA MALLOI,' A NEWLY INTRODUCED PYRALID (LEPIDOPTERA) FOR THE CONTROL OF ALLIGATORWEED IN THE UNITED STATES,
Florida Univ., Gainesville.
J. L. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 946, Price codes: A05 in paper copy, A01 in microfiche. 1973. 70 p, 4 fig, 19 tab, 17 ref.

Descriptors: *Vogtia malloi, *Aquatic weed control, *Biocontrol, *Insects, *Alligatorweed, *Agasicles hygrophilia, Alternanthera philoxeroides, Alligatorweed stem borer, Alligatorweed flea beetle, Nutrients, Lakes, Streams, Plant growth, Southeast U.S., Florida, South Carolina, Lepidoptera, Regression analysis.

Vogtia malloi, alligatorweed stem borer, is evaluated as a biological control agent for alligatorweed (alternanthera philoxeroides). Additional studies included insect-host relationships between V. malloi and Agasicles hygrophilia (alligatorweed flea beetle) and alligatorweed, nutrient levels and alligatorweed growth, growth of the weed in lakes and in streams, alligatorweed productivity in greenhouse and field plot studies, and multivariate regression analysis measuring the significance of each of 12 variables influencing growth and spread of alligatorweed. In the latter study all variables but chlorides were significant at 0.01, the most important being iron, turbidity, nitrates, hardness, water depth, and Agasicles. Vogtia malloi, introduced into the U.S. in 1971 for biocontrol in South Carolina and Florida, expanded randomly as alligatorweed became damaged. Both Vogtia and Agasicles survived subfreezing temperatures at Columbia, South Carolina indicating they can extend their range to the northern limit of alligatorweed infestation. At Garden's Corner, South Carolina, as Agasicles subsided during the summer, Vogtia increased and stressed alligatorweed the entire growing season. This study shows that Agasicles prefer younger leaves, and that as stem density increases, Vogtia abundance decreases and Agasicles increases. Alligatorweed grows better in shallow, fertile ponds than in deep, clean water. (Lynch-Wisconsin)
W78-09239

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION,
Agricultural Research Service, Temple, TX. Grassland-Forage Research Center.
V. L. Hauser.
Paper No. 77-2016 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 326-29, 1977, Raleigh, North Carolina, 10 p, 5 fig, 1 tab, 12 ref.

Descriptors: *Seepage control, Seepage, Canal seepage, *Hydraulic conductivity, *Soil particles, Clays, Soil aggregates.

The hydraulic conductivity of soils can be substantially reduced by the addition of gravel or aggregates which are at least 15 times larger than the particle size of the soil. The amount of clay required to control seepage can be reduced by half by the addition of aggregates at least 15 times larger than the particle size of the base soil. (Skogerboe-Colorado State)
W78-09264

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W78-09268

4B. Groundwater Management

WATER IN CARBONATE ROCKS-U.S. PROGRESS IN PERSPECTIVE.
National Committee for the International Hydrological Decade, Wash DC.
For primary bibliographic entry see Field 2F.
W78-08819

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08836

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08839

CHEMICAL QUALITY OF GROUND WATER IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-08841

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, MAY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08843

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08845

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08848

GEOHYDROLOGIC EVALUATION OF A LANDFILL IN A COASTAL AREA, ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08849

HYDRAULIC CONDUCTIVITY AND WATER QUALITY OF THE SHALLOW AQUIFER, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08854

ALTITUDE AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER, DUVAL COUNTY, FLORIDA,
Geological Survey, Jacksonville, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08855

THE WINONA-TALLAHATTA AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Division.
For primary bibliographic entry see Field 7C.
W78-08856

WATER-QUALITY CONDITIONS IN SOUTHERN ROCKINGHAM COUNTY, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.; and Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5B.
W78-08858

GEOTHERMAL RESOURCES: WATER AND OTHER CONFLICTS ENCOUNTERED BY THE DEVELOPER,
Vranesh, Raisch, and Schroeder, Boulder, CO.
For primary bibliographic entry see Field 6E.
W78-08975

WATER THAT IS NOT WATER.
Utah Univ., Salt Lake City. Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-08976

PROCEEDINGS ON CONFERENCE ON GEOTHERMAL ENERGY AND THE LAW HELD IN SANTA BARBARA, CALIFORNIA ON FEBRUARY 3, 4 AND 5, 1975.
For primary bibliographic entry see Field 6E.
W78-08991

CONTAMINANT TRANSPORT TO DEEP WELLS,
Weston (Roy F.), Inc., Roslyn, NY.
For primary bibliographic entry see Field 5G.
W78-09034

ECONOMIC IMPACT OF DIMINISHING GROUNDWATER RESERVES ON CORN PRODUCTION UNDER CENTER-PIVOT IRRIGATION,
Washington Univ., St. Louis, MO. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 3F.
W78-09142

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5B.
W78-09151

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-09174

A FULLY COUPLED CONSOLIDATION MODEL OF THE SUBSIDENCE OF VENICE,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-09198

AUTOMATIC ANALYSIS OF PUMPING TEST DATA-APPLICATION TO THE BOULTON AND HANTUSH HYPOTHESES (ANALYSE AUTOMATIQUE DES DONNEES DE POMPAGE D'ESSAI-APPLICATION AUX HYPOTHESES DE BOULTON ET D'HANTUSH),
Lille-1 Univ., Villeneuve d'Ascq (France).
For primary bibliographic entry see Field 2F.
W78-09205

GROUNDWATER STORAGE RIGHTS IN THE WESTERN STATES,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-09269

4C. Effects On Water Of Man's Non-Water Activities

METHOD FOR EVALUATING THE POSSIBLE CHANGES OF THE HYDROLOGIC CYCLE IN THE LANDSCAPES OF THE EXCESSIVELY WET ZONE AFTER A MODIFICATION OF THE ENVIRONMENT,
For primary bibliographic entry see Field 2A.
W78-08815

URBAN EFFECTS ON SEVERE LOCAL STORMS AT ST. LOUIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-08831

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
R. W. Hardy, R. A. Andrews, R. B. Davis, H. B. Gunner, and E. C. Leduc.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 514, Price codes: A08 in paper copy, A01 in microfiche. Completion Report, September 1977. 172 p, 14 fig, 8 tab, 75 ref. OWRT C5342 (No. 4240)(4).

Descriptors: *Lakes, *Urbanization, *New England, *Methodology, *Regional analysis, *Regional development, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Connecticut, Regional economics, Path of pollution, Pesticides, Nutrients, Phosphates, Toxins, Paleolimnology, Limnology, Watersheds, Regions, River basin commissions, Project planning, Social aspects, Human population, Management, Planning, Multiple-purpose projects, Research and development, Model studies, Prototypes, Institutions, Water policy, *Interdisciplinary research, *Research management, *Lakeshed, *Regional research, *Multi-university, Communication process, Public involvement(Or participation), Trace metals, Research coordination, Economic development, Social attitudes, Lake profile, Multi-state institutions.

Research management for interdisciplinary multi-university programs for multi-state areas was analyzed. Conclusions were reached about identifying research needs, phasing, lead time, public communication, and selecting a research team. Some conclusions are: (1) an integrated, multi-university team approach with central management is feasible and desirable for most regional projects; (2) a model has to be developed for defining and organizing research components; (3) a regional overview combined with case studies is appropriate; (4) a communication and technology transfer strategy should be used; and (5) coordination and research leadership are joint functions. Urbanization is defined as a social and physical process. Impacts of urbanization on New England lakesheds are explained. Economic and political implications are analyzed in terms of public and private attitudes and responsibilities. Most direct impacts and lake management efforts are local. Six lakeshed profiles were developed after an analysis of the lakesheds' social changes (urbanization), ecologies and management problems. Local attitudes are analyzed and compared. Major conclusions were: (1) the immediate problem is control of nutrients, primarily phosphates; (2) toxic materials represent a growing public health issue; (3) remedial measures such as chemical treatment, tend to create more problems than they solve; (4) airborne pollutants from precipitation represent newly recognized and growing problems; and (5) managers must address complex social as well as natural lakeshed problems. Information and technical assistance as well as long range planning are recommended. (See also W78-08954 and W78-08955)
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
R. W. Hardy, R. A. Andrews, R. B. Davis, H. B. Gunner, and E. C. LeDuc.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 515, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December 1977. 24 p, 8 fig, 1 tab, 26 ref. OWRT C5342(No. 4240)(5).

Descriptors: *Lakes, *Urbanization, *New England, *Regional analysis, *Regional development, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Connecticut, Path of pollution, Limnology, Watersheds, Regions, River basin commissions, Social aspects, Human population, Management, Institutions, Water policy, *Lakeshed, *Regional research, *Multi-university, Communication process, Public involvement(Or participation), Economic development, Social attitudes, Lake profile, Multi-state institutions.

This volume represents a summary of the main report, Volume I, and was prepared for public information and education. Urbanization is defined as a social and physical process. Impacts of urbanization on New England lakesheds are explained. Economic and political implications are analyzed in terms of public and private attitudes and responsibilities. Despite an array of distant causes most direct impacts and lake management efforts are local. Six lakeshed profiles were developed after an analysis of the lakesheds' social changes (urbanization), ecologies and management problems. Local attitudes are analyzed and compared. Major conclusions were: (1) the immediate problem is control of nutrients, primarily phosphates; (2) toxic materials represent a growing public health issue; (3) remedial measures such as chemical treatment, tend to create more problems than they solve; (4) airborne pollutants from precipitation represent newly recognized and growing problems; and (5) managers must address complex social as well as natural lakeshed problems. Information and technical assistance as well as long range planning are recommended. (See also W78-08953 and W78-08955)
W78-08954

EARTHFLOWS IN FRANCISCAN MELANGE, VAN DUZEN RIVER BASIN, CALIFORNIA,
National Park Service, Orick, CA. Redwood National Park.
For primary bibliographic entry see Field 2J.
W78-09054

THE UTILIZATION OF BLANKET BOG VEGETATION BY GRAZING SHEEP,
Hill Farming Research Organization, Edinburgh (Scotland).
S. A. Grant, W. I. C. Lamb, C. D. Kerr, and G. R. Bolton.
Journal of Applied Ecology, Vol. 13, No. 3, p 857-869, December, 1976. 1 fig, 6 tab, 17 ref.

Descriptors: *Grazing, *Sheep, *Bogs, Wetlands, Scotland, Livestock, Domestic animals, Vegetation, Foods, Diets, Patterns of utilization, Stocking rates.

Three bog areas were grazed at monthly intervals at the times of the year when sheep would graze these areas in hill sheep production systems incorporating areas of improved pasture. Three stocking rates were used on each site. During May-July grazing was confined mainly to Molinia caerulea, Trichophorum caespitosum and scattered plants of Deschampsia flexuosa, Agrostis canina and Carex species. Calluna vulgaris, Eriophorum vaginatum and E. angustifolium were hardly eaten. As the year advanced, the grazing of the first group of species decreased, and that of the second group increased. During January-March Calluna vulgaris and E. vaginatum formed the basis of the diet. Utilization patterns are discussed in relation to seasonal patterns of availability and in vitro digestibility. Stocking rate had little effect on level of utilization where preferred species were in short supply and utilization was high. Where preferred species were plentiful stocking rate had a large effect. (Stihler-Mass)
W78-09077

MAN'S INFLUENCE ON THE DEVELOPMENT OF THE ESTUARINE MARSH, FLAX POND, LOND ISLAND, NEW YORK,
New York Univ., NY. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W78-09091

GRAVEL PITS AS NEW WETLAND HABITATS FOR THE CONSERVATION OF BREEDING BIRD COMMUNITIES,
London Univ. (England). Dept. of Zoology.
C. K. Catchpole, and C. F. Tydeman.
Biological Conservation, Vol 8, No 1, p 47-59, July, 1975. 3 fig, 2 tab, 31 ref.

Descriptors: *Wetlands, *Quarries, *Birds, Habitats, Breeding, Marshes, Recreation, *Gravel pits, Great Britain.

Breeding bird communities in gravel pit wetland habitats contain a wide variety of species, often at high breeding densities. As natural wetlands come under increasing pressure, it is suggested that these new wetlands are important for the future conservation of marshland and aquatic species, and may also act as reservoirs of diversity and abundance in a rapidly changing environment. Conservation of some gravel pits should be based on their overall value as conservation, education, and recreation areas near urban centers; other gravel pit wetlands may relieve the increasing public pressure on natural wetlands. Present trends in the utilization of gravel pits for recreation are discussed. (Stihler-Mass)
W78-09105

THE CRANESVILLE PINE SWAMP,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 2H.
W78-09107

DEICING SALT MOVEMENT AND ITS EFFECTS ON SOIL PARAMETERS AND VEGETATION,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-09122

4D. Watershed Protection

FAILURE SEQUENCE OF GULLY HEADWALLS IN WESTERN IOWA,
Missouri Agricultural Experimental Station, Columbia.
J. M. Bradford, R. F. Piest, and R. G. Spomer.
Soil Science Society of America Journal, Vol. 42, No. 2, p 323-328, March 1978. 6 fig, 1 tab, 20 ref.

Descriptors: *Erosion, *Iowa, *Missouri, *South Carolina, Soil strength, Sedimentation, Slope stability, Gully erosion, Loess, Alluvium, Geomorphology, Soil structure, *Soil morphology, Gully erosion rates, Gully erosion control, Popout, Alcove failure.

A characterization of the failure sequence of gully headwalls and banks is necessary to predict gully erosion rates and to develop controls. A model was given for the sequential nature of gully growth in the thick loessial area of western Iowa. The failure sequence includes a popout or alcove failure near the toe of a near-vertical wall; columnar sloughing of the overhanging material; and finally, the transport of the eroded material downstream. The initiating failure at the base of the wall is a result of weakening of the soil material by wetting. The gully bank failure sequence and geometry in the western Iowa loess region were compared to gully erosion studies in the glacial drift region of northwestern Missouri and in the Piedmont of South Carolina. (Lee-ISWS)
W78-08835

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1977,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08847

WATER-QUALITY ASSESSMENT OF THE MUDDY FORK SILVER CREEK WATERSHED, CLARK, FLOYD, AND WASHINGTON COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08859

CORN-SOYBEAN TILLAGE SYSTEMS: EROSION CONTROL, EFFECTS ON CROP PRODUCTION, COSTS,
Illinois Univ. at Urbana-Champaign, Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09048

A WATER-BALANCE MODEL FOR DEEP LOESS SOILS,
Iowa State Univ. Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-09049

EARTHFLOWS IN FRANCISCAN MELANGE, VAN DUZEN RIVER BASIN, CALIFORNIA,
National Park Service, Orick, CA. Redwood National Park.
For primary bibliographic entry see Field 2J.
W78-09054

CANAL SEEPAGE REDUCTION BY SEDIMENT LADEN WATER,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4A.
W78-09129

RESOURCE ADEQUACY IN LIMITING SUSPENDED SEDIMENT DISCHARGES FROM AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 2J.
W78-09141

EVAPORATION FROM FORESTS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2D.
W78-09212

AN EXPERIMENTAL STUDY OF GEOMORPHIC THRESHOLDS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-09216

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
For primary bibliographic entry see Field 6B.
W78-09247

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE,
For primary bibliographic entry see Field 6B.
W78-09248

THE USE OF CATCHMENT AREAS AS FLORA AND FAUNA RESERVES,
National Parks, Victoria (Australia).
For primary bibliographic entry see Field 6G.
W78-09251

PREDICTING SEDIMENT YIELD FROM AGRICULTURAL LAND,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-09254

THE ANSWERS MODEL: A PLANNING TOOL FOR WATERSHED RESEARCH,
Arkansas Univ., Fayetteville. Dept. oof Agriculture Engineering.
For primary bibliographic entry see Field 2J.
W78-09257

EVALUATION OF THE COMPONENTS OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Boise ID.
For primary bibliographic entry see Field 2A.
W78-09258

FILTRATION OF NON-HOMOGENEOUS SEDIMENT BY SIMULATED VEGETATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-09259

A COMPARISON OF DETERMINISTIC MATHEMATICAL WATERSHED MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
E. R. Perrier, J. Harris, and W. B. Ford, III.
Paper No. 77-2047 presented at the 1977 Annual Meeting, American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 33 p, 10 fig, 3 tab, 13 ref, 1 append.

Descriptors: *Simulation analysis, *Model studies, *Watershed management, Watersheds(Basins), *Mathematical models, Drainage basins, Arkansas, Caddo River basin(Ark).

Mathematical Watershed Models Hydrocomp, SWM, SSARR, HEC-1 and United States Department of Agriculture-HL75 were reviewed using input data from the Caddo River drainage basin for mathematical simulation comparisons. The attributes of each model are presented permitting the selection of a model most appropriate for a specific application to chemical washoff algorithms. (Skogerboe-Colorado State)
W78-09262

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SOME METHODS AND INSTRUMENTS FOR AUTOMATED MONITORING OF THE CHEMICAL COMPOSITION OF SURFACE WATERS,
Hydrochemical Inst. Novocherkassk (USSR).
V. B. Stradomskiy, A. P. Belousov, V. M. Mukhin, and A. A. Nazarova.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 300-308, 1976. 10 fig, 1 tab, 11 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 63, p 32-51, 1976.

Descriptors: *Pollutant identification, *Water chemistry, *Monitoring, *Sampling, *Automation, Instrumentation, Equipment, Measurement, Water pollution effects, Hydrogen ion concentration, Oxidation-reduction potential, Ions, Organic compounds, Water temperature, Dissolved oxygen, Electrical conductance, Suspended solids, Water levels, Water pollution, Water quality, Pollutants, Electronic equipment, *USSR.

The principles of instrumentation for monitoring the chemical composition of surface water must be developed. Just as the construction of models of automatic measuring equipment, these principles have not yet been worked out sufficiently, although they must supply the automatic stations and portable and laboratory instruments being developed with the necessary sensors and automatic devices. At the present time, the chemical characteristics of water are being determined by potentiometric, conductometric, volt-ampere, and photocolorimetric methods. The instruments used in these methods do not operate automatically. Therefore, the Section of Complex Automation of Surface Water Analysis of the Hydrochemical Institute is investigating the automation of the aforementioned instruments, mainly the use of the electrode systems (sensors) of automatic stations, the effect of pollutants on the instruments and methods of protecting the instruments from pollutants. The section also works on new sensors for measuring several additional surface water characteristics. Experimental models of instruments and an automatic water quality monitoring station have been developed and constructed. (Sims-ISWS)
W78-08812

PROBLEM OF ESTIMATING THE RELIABILITY OF INFORMATION OBTAINED BY AN AUTOMATED WATER QUALITY MONITORING AND CONTROL SYSTEM,
Hydrochemical Inst. Novocherkassk (USSR).
A. P. Belousov, A. P. Sibilev, and V. B. Stradomskiy.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 309-312, 1976. 4 fig, 1 tab, 4 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 63, p 86-91, 1976.

Descriptors: *Data processing, *Water quality, *Monitoring, *Sampling, Water pollution, Measurement, Water chemistry, Pollutants, Chemicals, Water temperature, Dissolved oxygen, Chlorides, Electrical conductance, Analytical techniques, *USSR.

The hydrochemical information obtained by the automatic stations of automated water quality monitoring and control systems is unavoidably distorted as it is being transmitted, transformed, and processed. These distortions stem from the uneven distribution of the concentration of ingredients being monitored, the imperfections of the measuring and conversion sections of an automatic station, and the information retrieval methods. The effect of the uneven distribution of the concentration of the monitored ingredient along a section and of the errors introduced by the measuring and converting parts of stations on the reliability of the information obtained by a water quality monitoring and control system were examined. It was concluded that with the proper selection of the distance from the site of waste water discharge to the automatic monitoring station site, the measurement error stemming from the uneven distribution of the measured characteristic along a section lies within 10% of the average value. The component of the error produced by the imperfection of the measuring and converting devices of an automatic station must be of the same order of magnitude as the error stemming from the irregularity of concentration along a section. (Sims-ISWS)
W78-08813

INTRA-ANNUAL VARIATIONS IN THE CONCENTRATION OF BIOGENIC ELEMENTS AND DISSOLVED GASES IN THE EASTERN PART OF THE BALTIC SEA,
For primary bibliographic entry see Field 5B.
W78-08816

SOME THEORETICAL ASPECTS OF STABILITY AND SOLUBILITY OF INORGANIC ARSENIC IN THE FRESHWATER ENVIRONMENT,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
R. Wagemann.
Water Research, Vol. 12, No. 3, p 139-145, 1978. 3 fig, 3 tab, 39 ref.

Descriptors: *Arsenic compounds, Water chemistry, *Sodium arsenite, Chemical properties, *Phase diagrams, Chemical analysis, Inorganic compounds, Stability, Solubility, Physical properties, Hydrogen ion concentration, Theoretical analysis, Chromium, Iron, Copper, Freshwater, *Arsenic, *Arsenates, *Metal arsenates.

The concentrations of some major and minor ionic constituents of different freshwater systems were listed, and 'typical' concentration estimates were given for freshwater in general. Fourteen different metals were examined for a possible controlling influence on total dissolved arsenic in freshwater. Four metals (Ba, Cr, Fe, Cu) emerged as possible candidates and were examined more closely. The total dissolved arsenic concentration allowed by each of these metal arsenates is shown as a function of pH when the metal ion activity itself is controlled by a relatively insoluble compound. Barium ion at a concentration typical for freshwater emerges as the most convincing candidate capable of holding total dissolved arsenic to rather low concentrations, while chromium and iron emerge as possibilities. A new E sub h-pH diagram for arsenic showing the relative stability domain for barium arsenate was presented in which the arsenic sulfide domains have been included and somewhat simplified and clarified. (Henley-ISWS)
W78-08834

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08836

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-08845

GROUND-WATER SUPPLIES IN THE MURFREESBORO AREA, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08848

REDOX PROCESSES AT SURFACES OF MANGANESE OXIDE AND THEIR EFFECTS ON AQUEOUS METAL IONS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-08851

STABILITY OF FLUORIDE COMPLEX WITH SILICA AND ITS DISTRIBUTION IN NATURAL WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-08852

HYDRAULIC CONDUCTIVITY AND WATER QUALITY OF THE SHALLOW AQUIFER, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08854

MAUMEE RIVER BASIN LEVEL-B STUDY, WATER SUPPLY TECHNICAL PAPER,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-08857

WATER-QUALITY ASSESSMENT OF THE MUDDY FORK SILVER CREEK WATERSHED, CLARK, FLOYD, AND WASHINGTON COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08859

LARVAL FISH DRIFT IN A LARGE RIVER WITH A COMPARISON OF SAMPLING METHODS,
Ichthyological Associates, Inc., Berwick, PA.
W. F. Gale, and H. W. Mohr, Jr.
Transactions of the American Fisheries Society, Vol 107, No 1, p 46-55, 1978. 5 fig, 4 tab, 25 ref.

Descriptors: *Larval growth stage, *Aquatic drift, *Temporal distribution, *Diurnal distribution, *Sampling, *Bottom sampling, Fish behavior, *Nets, *Spatial distribution, *Fish reproduction, Growth stages, On-site data collections, Fresh water fish, Fish migration, Pennsylvania, *Larval fish drift, *Susquehanna River(Penn).

Larval fish drift in the rocky-bottomed Susquehanna River (northeastern Pennsylvania) was investigated during 1974-1975. At least 18 species of drifting larvae were collected by nets mounted on a stationary boat or by pumping. Maximum densities of 15.4 and 27.1 larvae/10 m3 were found in June 1974 and 1975, respectively. Quillback, (56%), minnows (25%), and carp, (14% of the total) were the most abundant larvae caught in 1974 by pumping. The few larvae that drifted during the day were mostly near the bottom. large numbers of quillback, white sucker shorthead redhorse and tessellated arter larvae drifted near the river surface at night. Drift was maximum at about 2400 h. Overall, the day/night drift ratio was 1/3.8. Boat-mounted nets and the pump sampler had equal sampling efficiencies. Condition of larvae in pump samples was related to net material, mesh size, net shape, and pumping duration. Larvae in best condition were in 5-min samples pumped into slender nets (mouth/length ratio 1/10) made of fine-meshed monofilament nylon. (EIS-Deal)
W78-08867

THE IMPLICATIONS OF COMMUNITY STRUCTURE FOR BENTHIC MONITORING STUDIES,
Leeds Univ. (England). Wellcome Marine Lab.
J. R. Lewis.
Marine Pollution Bulletin, Vol. 9, No. 3, p 64-66, 1978. 2 fig.

Descriptors: *Biological communities, *Benthos, *Water pollution effects, *Monitoring, *Sampling, *On-site data collections, *Estimating, *Statistical methods, *Ecosystems, *Population, Water quality, Marine biology.

The author suggests that, when monitoring the effects of pollution, collecting every bit of information about each individual of each species in a transect or grid is highly wasteful of effort and resources. He proposes that, if the pre-pollution ecology is well understood, it would be both adequate and most practical to concentrate upon relatively few, relatively manageable species. This assumes that the key species are not more resistant to pollutants than are species of different life-form and competitive ability. (EIS-Deal)
W78-08870

UPTAKE OF RADIOACTIVITY BY MARINE SEDIMENTS AND IMPLICATIONS FOR MONITORING METAL POLLUTANTS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. A. Hetherington, and B. R. Harvey.
Marine Pollution Bulletin, Vol. 9, p 102-106, 1978. 2 fig, 4 tab, 9 ref.

Descriptors: *Absorption, *Sediments, *Monitoring, *Radioactivity, Data collections, Analytical techniques, Water quality, Water properties, Metals, Sedimentology, Sediment discharge, Sediment distribution, Suspended solids, *Radionuclide sedimentation.

The value of studying artificially-produced radionuclides in the marine environment was discussed in the wider context of monitoring sediments for other metal pollutants. Differences in the dispersion of selected radionuclides discharged from the same known source were used to illustrate the sort of changes in phase or speciation which must occur with other metal pollutants, but which cannot be demonstrated directly because of the multiplicity of sources. Various chemical and physical procedures were discussed which can be applied to a study of heavy metal associations with marine sediments, as were questions such as the existence, or otherwise, of mechanism for the slow release of adsorbed material from the buried sediment back into the water column. Suggestions were made as to how radionuclide studies may be helpful in answering questions such as these, which were considered to be vital for the meaningful interpretation of sediment analyses. (EIS-Klein)
W78-08871

FISH COUGH RESPONSE - A METHOD FOR EVALUATING QUALITY OF TREATED COMPLEX EFFLUENTS,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-08874

ZINC CONTENT IN OTOLITHS OF MACKEREL FROM THE AEGEAN,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
C. Papadopoulou, G. D. Kanias, and E. M. Kassimati.
Marine Pollution Bulletin, Vol. 9, p 106-108, 1978. 5 fig, 1 tab, 12 ref.

Descriptors: *Metals, *Zinc, *Fish physiology, *Marine fish, Analytical techniques, Oceans, Metabolism, Fish diets, Fish behavior, Path of pollutants, Life history studies, *Pollutant identification, *Mackerels, Bioaccumulation, *Aegean Sea, Tissue analysis, *Otoliths, Scomber japonicus colias.

The zinc content in otoliths of the mackerel Scomber japonicus colias was determined by instrumental neutron activation analysis. Six groups of twelve specimens were selected from 3 areas of the Aegean sea. The zinc content was found to be a linear function of age and body length. The decrease of the metal concentration in the older was considered to be due to metabolic factor differences, to food intake or larger fish, or to fish movement. (EIS-Klein)
W78-08876

RECOVERY OF INDICATOR BACTERIA IN ACID MINE STREAMS,
West Virginia Univ., Morgantown.
C. R. Hackney, and G. K. Bissonnette.
Journal of the Water Control Federation, Vol 50, p 775-780, 1978. 4 fig, 18 ref.

Descriptors: *Bioindicators, *Bacteria, *Acidic water, *Acid streams, Mine wastes, Coliforms, Microbiology, Pathogenic bacteria, Sewage bacteria, E coli, Streptococcus, Analytical techniques, Laboratory tests, Sampling, Population, Toxicity, Methodology, *Microbiological tests, Media, Bacteriology, E aerogenes, S faecalis, Bacteria recovery.

The recovery characteristics of three sanitary-indicator bacteria were examined as a function of exposure to the environment of two acid mine streams. Membrane filter chambers containing pure cultures of Streptococcus faecalis, Escherichia coli, or Enterobacter aerogens were placed into acid mine streams. Samples were withdrawn periodically from the chambers and were enumerated simultaneously with rich non-selective media and specific selective media so that both injury and survival characteristics could be investigated. E. coli and E. aerogenes had similar recovery characteristics, as reflected by rapid die-away. In addition, these coliforms were sublethally injured rapidly in the acid mine streams, perhaps indicating that the use of selective media for their enumeration would give an erroneous impression of the number of coliforms actually present. Compared to the coliforms tested, S. faecalis persisted much longer. No significant injury was incurred by S. faecalis. (EIS-Klein)
W78-08882

USE OF HYDROPONICS TO MAINTAIN QUALITY OF RECIRCULATED WATER IN A FISH CULTURE SYSTEM,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
For primary bibliographic entry see Field 5G.
W78-08884

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-08887

DETERMINATION OF PHOSPHATE FLUXES ACROSS THE SEDIMENT-WATER SURFACE OF THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-08897

FIELD INFRARED METHOD TO DISCRIMINATE NATURAL SEEPS FROM NON-SEEPS (SANTA BARBARA, CALIFORNIA AREA),
Coast Guard Research and Development Center, Groton, CT.
D. Eastwood, and D. F. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 861, Price codes: A02 in paper copy, A01 in microfiche. Final Report No. CG-D-32-77, December 1976. 25 p, 8 fig, 1 tab.

Descriptors: *Oil spills, *Seepage, *Pollutant identification, Water pollution sources, California, *Outer Continental Shelf, *Santa Barbara Channel(Calif).

A field infrared method has been developed to distinguish oil due to natural seepage in the Santa Barbara (California) Channel region from closely similar oils derived from spills at offshore drilling platforms or from shipping accidents. Differences between seep and non-seep oils have been found to persist in weathering studies carried out in outdoor tanks for one week. This method involves simple infrared instrumentation and a minimum of sample preparation. It permits rapid on-site analysis without special training. The major differences

between seep and non-seep oils appear in the comparison between the 13.8 micron and 13.5 micron peaks (for both weathered and unweathered oils) and in the carbonyl region at 5.85 micron (for unweathered oils only). (Sinha-OEIS)
W78-08900

METHOD OF IDENTIFYING SOURCE OF PETROLEUM FOUND IN THE MARINE ENVIRONMENT. REPORT II,
Stanford Research Inst., Menlo Park, CA.
M. E. Scolnick, A. C. Scott, and M. Anbar.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 256, Price codes: A05 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-37-77, November 1976. 94 p, 23 fig, 15 tab, 14 ref, append. DOT-CG-81-74-1187.

Descriptors: *Pollutant identification, *Oil pollution, Water pollution sources, *Outer Continental Shelf, Petroleum, Mass spectrometry.

The identification of oils by field ionization mass spectrometry is reported. Two multivariate data analysis models are described; a parametric statistical model that is based on the assumption of stochastic independence and an empirical model that can be used in a 'learning machine' mode. The results of applying the empirical model to 154 quadrupole spectra and 42 sector magnet spectra are reported. (Sinha-OEIS)
W78-08901

USE OF PATTERN RECOGNITION TECHNIQUES FOR TYPING AND IDENTIFICATION OF OIL SPILLS,
Rice Unic., Houston, TX.
H. L. Curtis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 802, Price codes: A02 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-38-77, April 1977. 20 p, 5 fig, 2 tab, 9 ref. DOT-CG-81-75-1383.

Descriptors: *Pollutant identification, *Oil spills, *Analytical techniques, Water pollution, Oil pollution, *Outer Continental Shelf, *Pattern recognition.

The infrared spectra of oils have many sharp peaks and good identification results from reading just the amplitudes of these peaks. About fifteen properly chosen peaks will usually suffice. Simply reading peak amplitudes of fluorescene spectra will not suffice to give good identification, nor will the amplitudes at the valleys in between the peaks. Howeve, by assigning a sharpness factor to valleys and peaks, one can extract sufficient information to result in very reliable identification. An algorithm for doing this has been devised and implemented in the form of a computer program. A second purpose of the contract was to test the independence of the infrared and fluorescence spectra. A conservative formula is given based on the limited information currently available. (Sinha-OEIS)
W78-08902

THE MEASUREMENT OF OIL SPILL VOLUME BY A PASSIVE MICROWAVE IMAGER,
Coast Guard, Washington, DC. Office of Research and Development.
B. E. Troy, Jr., and J. P. Hollinger.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 821, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. CG-D-55-77, May 1977. 67 p, 16 fig, 2 tab, 27 ref, append.

Descriptors: *Oil spills, *Water pollution, *Pollutant identification, Remote sensing, Measurement, *Outer Continental Shelf, Microwave images.

An airborne passive microwave system has been developed and used in a test program to detect a marine oil spill and to determine its thickness and volume. A controlled spill of 2040 liters (538 gallons) of No. 2 fuel oil was conducted from a Coast Guard vessel 20 miles off the Virginia shore. Microwave images of the spill were obtained at both 22.4 and 31.0 GHz on five consecutive aircraft passes over the visible oil slick. Wind and weather conditions were moderate during the test. The microwave images were processed on a computer and shown on a color television display system. These color images revealed a small region of relatively thick oil, surrounded by a larger region of much thinner oil, in agreement with results from an earlier program. The thin oil region corresponded to the visible oil slick and showed up clearly in the color images against the unpolluted open sea. It is thus possible to outline the entire visible slick and to locate the thick oil regions within it by means of a microwave image. Maximum oil thickness was approximately 0.6 mm in the thick region which was located on the downwind side of the visible slick. The oil spill volume was determined by integrating the oil thickness over area in the computer. Each microwave image of the spill was made in the few seconds necessary for the aircraft to pass over the spill. This rapid data-taking capability is a significant improvement over the earlier developmental program which used fixed downward-looking radiometers, and required approximately one hour and a dozen aircraft passes to gather the data necessary to reconstruct a microwave picture of the slick. (Sinha-OEIS)
W78-08903

A FLUME FOR THE STUDY OF CONTAINED OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W78-08905

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA. Institute of Electrical and Electronics Engineers, Inc., New Yori, N.Y. IEEE Catalog No. 76CH1247-6C, 1977. Workshop held at Coronado, California, November 11-12, 1976. 175 p. Chien, Y. T. and Killeen, T. J. (Eds.).

Descriptors: *Pollutant identification, *Oil pollution, *Oil spills, *Monitoring, *Conferences, Oil wastes, Analytical techniques, *Waste identification, Methodology, *Outer Continental Shelf, *Pattern recognition,(Oil pollution), Pollution monitoring, Path of pollutants.

This Proceedings is a collection of the papers presented at the Workshop during a two-day informal gathering at Coronado, California on November 11-12, 1976. It represents the latest views and analyses of more than thirty specialists on the subject of oil identification and its relation to pattern recognition. Theories, laboratory experiments and on-site-tests were all cross-examined in an atmosphere of critical assessment and learning from each other. (See W78-08935 thur W78-08951) (Sinha-OEIS)
W78-08934

THE INFLUENCE OF WEATHERING ON IDENTIFICATION OF SPILLED OIL SAMPLES,
Coast Guard Research and Development Center Groton, CT.
A. P. Bentz.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 5-14, 6 fig, 8 ref.

Descriptors: *Oil spills, *Weathering, *Pollutant identification, Water pollution sources, Oil pollution, *Spectroscopy, Pattern recognition, Spectroscopic analysis.

Infrared spectroscopic analysis of oils is used as an example to discuss the influence of weathering on pattern recognition. Simulated weathering of suspect oils is recommended to facilitate pattern matching. (See also W78-08934) (Sinha - OEIS)
W78-08935

PATTERN RECOGNITION AND OIL SPILL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
Y. T. Chien, and T. J. Killeen.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 15-33, 12 fig, 14 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Oil pollution, *Pattern recognition(Oil pollution), Computer systems.

A brief review of pattern recognition technology as applied to oil spill identification is presented. Two computer-based systems that are potentially useful for oil spill identification are described. The first is an interactive graphics system which is most suitable for manipulating discrete waveforms (such as FL or IR Spectra), with the aid of graphical display. The other system is a general 2-dimensional pictorial information processor, which is potentially useful for identifying oil images such as those produced by the TLC technique. (See also W78-08934) (Sinha - OEIS)
W78-08936

STATISTICAL PROBLEMS IN OIL IDENTIFICATION,
Standard Oil Co. (Ohio), Cleveland.
D. Frazier.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 34-36.

Descriptors: *Pollutant identification, *Oil spills, *Statistics, Water pollution sources, *Probability, Oil pollution, Pattern recognition, 'Prior probabilities'.

None of our statistical methods really calculate probabilities. All they provide are changes in probabilities. Two experts using impeccable statistics, will come to diametrically opposite conclusions because their prior probability assumptions are different and statistical theory is no help at all in assigning prior probabilities. The methods of statistical analysis of data that are used today work well in the laboratory where scientists can carefully explain to each other what they are doing, but the methods are little help in leading a modern American jury to a fair verdict in an oil spill case. (See also W78-008934) (Sinha - OEIS)
W78-08937

MEASUREMENT OF INDEPENDENCE OF FLUORESCENCE AND INFRARED SPECTRA OF OILS,
Rice Univ., Houston, TX. Dept. of Electrical Engineering; and Rice Univ., Houston, TX. Dept. of Mathematics.
S. A. Starks, and M. L. Curtis.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 37-46, 5 fig, 2 tab, 3 ref.

Descriptors: *Oil pollution, *Pollutant identification, *Oil spills, Water pollution sources, *Fluorescence, *Infrared radiation.

Numerous methods have been proposed and developed for the solution of the oil spill identification problem. Until recently not much attention was focused on the problem of a combined approach involving more than one of the analytical techniques. The objective of this study is to study the degree of dependence or conversely independence between results obtained from a dual library of digitized fluorescence and infrared spectral data. Standard results based on a lumped convariance matrix were inclusive. As a result, a method based on distance measures and cluster analysis was developed. (See also W78-08934) (Sinha - OEIS)
W78-08938

ARITHMETIC OPERATIONS ON SPECTRAL ARRAYS,
Digilab Inc., Cambridge MA.
A. W. Mantz.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 47-59, 1 fig, 24 ref.

Descriptors: *Pollutant identification, *Oil pollution, Water pollution sources, *Spectroscopy, *Arithmetric operations, Spectral arrays(Oil pollution), Fourier transform.

Arithmetric Operations in entire Spectral Arrays are now routine with computer based infrared Fourier transform Spectrophotometers. Absorbance subtraction of spectral arrays is used for spectral separation of mixtures without requiring wet chemistry which is time consuming and costly. Correlation programs applied to specific technical areas such as oil spill analysis may provide an even more powerful method for completely automatic identification. The general problems of Array Arithmetric Operations are considered as well as the utilization of correlation programs and the instrumental requirements (which are severe), necessary to accomplish such a goal. (See also W78-08934) (Sinha - OEIS)
W78-08939

PATTERN RECOGNITION PROGRAMS: APPLICATION TO OIL IDENTIFICATION,
Washington Univ., Seattle. Dept. of Chemistry.
B. R. Kowalski, and D. L. Duewer.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 60-65, 18 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Chemistry, Oil pollution, *Pattern recognition(Oil pollution), Software system.

A large software system of pattern recognition and associated multivariant methods has been developed, tested, and applied to several different chemical studies. This paper presents a description of the development and philosophy of this software system and, in accordance with the goals of this workshop, briefly describes the results of the application of the system to the problem of oil spill identification. (See also W78-08934) (Sinha-OEIS)
W78-08940

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS--OR DID THE REAL SPILLER GET AWAY,
Connecticut Univ., Storrs.
T. J. Killeen, and Y. T. Chien.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 66-72, 1 fig, 2 tab, 2 ref.

Descriptors: *Pollutant identification, *Oil spills, Water pollution sources, *Probability, Model studies, Methodology, Oil pollution.

A method of revising the probability of guilt of suspects in an oil spill case is developed. This technique utilizes the information contained in spectra obtained from suspects and spill samples. It also considers the possibility that the true spiller escaped without being sampled. (See also W78-08934) (Sinha-OEIS)
W78-08941

SOME RELIEF FROM THE EFFECTS OF SYSTEMATIC ERROR IN THE APPLICATION OF STATISTICAL MODELS FOR THE ANALYSIS OF FIELD IONIZATION MASS SPECTROMETRIC DATA,
Stanford Research Inst., Menlo Park. Mass Spectrometry Research Center.
M. E. Scolnick.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 73-83, 5 fig, 1 tab, 3 ref.

Descriptors: *Pollutant identification, *Oil spills, Statistical models, Water pollution sources, Spectroscopy, *Mass spectrometry, Oil pollution, Mass spectrometric data, 'Fingerprinting'(Oil).

Integrated multiscan field ionization mass spectrometry has been used as a means of 'fingerprinting' oils. Inadequate control of the rate of which oils are evaporated into the ionization source produces systematic errors in the data. In addition to increasing spectral variances, these errors are responsible for at least some of the stochastic dependence that is observed between variations in peak intensity at different mass numbers and, therefore, precludes the use of relatively simple data analysis models. By normalizing the magnitude of each peak to the sum of the areas of its neighbors, rather than to the sum of all the peaks in the spectrum, the correlation between peaks with sufficient separation can be made to vanish. The dependence between neighboring peaks will increase, however, and some spectral information will be lost. The average spectral variance and the magnitude of the correlation coefficient can, nonetheless, be reduced, as demonstrated by the application of this technique to thirteen replicate spectra. (See also W78-08934) (Sinha-OEIS)
W78-08942

INFRARED SPECTRA OF PETROLEUM - DATA BASE INFORMATION AND APPLICATION TO REAL SPILLS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown, P. F. Lynch, and M. Ahmadjian.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 84-96, 5 fig, 6 tab, 6 ref.

Descriptors: *Oil spills, *Pollutant identification, *Water pollution sources, Baseline studies, Distribution, Path of pollutants, Data collections, Oil pollution, Infrared spectra(Oil).

Infrared spectra of 198 unweathered oils and 647 weathered oils were 'ratioed', and a statistic derived from the ratios was used to determine the distribution of spectral data. Distribution were obtained for pairs of same oils and for pairs of different oils. These two distributions have been used to determine the probability of a suspect being guilty. The method is applied to an actual spill case involving 12 suspects. (See also W78-08934) (Sinha-OEIS)
W78-08943

AN ON-LINE COMPUTERIZED INFRARED IDENTIFICATION SYSTEM,
Beckman Instruments, Inc., Irvine, CA. Scientific Instruments Div.
R. J. Obremski, H. J. Sloane, and J. Diaz-Rueda.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 97-112, 12 fig.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Spectroscopy, *Instrumentation, Oil pollution.

An on-line search and match routine has been developed for the Wang 2200 interfaced to a Beckman 4260 Infrared Spectrophotometer. A small file of standards was coded according to the locations of peaks, weighting them for importance. For identification, an unknown spectrum is similarly coded either manually, using human intelligence, or on-line by machine as the spectrum is produced, using predetermined criteria for acceptable bands. The coded unknown is then compared to the standards file and high-scored 'hits' reported. The system has been successfully applied to the identification of single- and multi-component unknowns tested against the standards file of OSHA-listed toxic substances. (See also W78-08934) (Sinha-OEIS)
W78-08944

STATISTICAL CONSIDERATIONS OF OIL IDENTIFICATION BY INFRARED SPECTROSCOPY,
National Oceanic and Atmospheric Administration, Washington, DC. Center for Experiment Design and Data Analysis.
J. S. Mattson.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 113-121, 1 tab, 16 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Statistical methods, *Spectroscopy, Analytical techniques, Instrumentation, Oil pollution, 'Fingerprinting'(Oil).

In any analytical method, it is important that the analyst be cognizant of both the analytical precision of an individual measurement and the degree of accuracy to which the measurement must be made in order to answer the question posited. In the field of oil identification, it is not legally sufficient merely to show that a given suspect could have spilled the oil in question. The 'burden of proof' imposed on the expert analyst is to show that it is highly probable that the spilled oil originated from the suspect source. This paper discusses the burden of proof problem from the point of view of the analytical chemist, using infrared spectroscopic 'Fingerprinting' as an example. (See also W78-08934) (Sinha - OEIS)
W78-08945

THE FUTURE OF MINI-COMPUTERS AND MICROPROCESSORS IN INFRARED ANALYSIS,
The Perkin-Elmer Corp., Norwalk, CT.
R. W. Hannah, and M. V. Zeller.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76H1247-6C, 1977. p 122-126.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Computers, Oil pollution, *Infrared analysis, Mini-computers, Microprocessors.

Significant changes are occurring in the specification, design and utilization of infrared spectrophotometers which are related to the influence of minicomputers and microprocessors. Data

reduction such as that involved in the characterization of oil spills has up to this time been carried out largely on minicomputer systems either directly interfaced to the infrared instrument or by operator entry of the relevant data from the plotted infrared spectrum. Infrared instruments are now appearing which contain a microprocessor and which are capable of performing at least some of the preliminary data processing. Certainly the process of extending the capability of the microprocessor will continue but the problem of meeting a specific demand will undoubtedly depend on how well the spectroscopic problem is defined and whether that problem can be solved by a generally useful instrument which can be adapted are discussed and a look at the possible future presented. (See also W78-08934) (Sinha - OEIS)
W78-08946

THE CLASSIFICATION OF LUBRICATING OILS USING DIGITAL INFRARED DATA,
Wilks Science Co., South Norwalk, CT.
W. Truett.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 127-128, 1 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Infrared radiation, Oil pollution, Lubricating oils, Digital infrared data.

The classification of lubricating oils and the measurement of their degradation is a matter of current concern. A number of approaches for data reduction have been explored including spectral overlays and numerical data reduction. The latter technique holds the greatest promise for completely automated analysis; however, until very recently, all absorbance data had to be manually collected from IR scans. The recent advent of the Wilks Model 80 microcomputer controlled IR spectrometer with digital output makes possible the rapid classification of lubricating oils with low cost instrumentation. A program of seventeen diagnostic wavelengths and one reference wavelength has been selected in the infrared from 2.5 to 14.5 microns and six widely differing products characterized before and after use treatment. Printout of the data requires less than two minutes, giving both wavelength and absorbance at each wavelength. (See also W78-08934) (Sinha - OEIS)
W78-08947

OIL CHARACTERIZATION BY MULTICOMPONENT FLUORESCENCE ANALYSIS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Pathology.
I. M. Warner, J. B. Callis, E. R. Davidson, and G. Christian.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 129-135, 2 fig, 2 tab, 12 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Fluorescence, Oil pollution, Pattern recognition.

Strategies for the simultaneous analysis of multicomponent fluorescent samples are presented. The algoithms require as input data the emission-excitation matrix, whose matrix elements are the fluorescence intensity values for excitation. The matrix can be analyzed to obtain (a) a lower bound to the number of spectral components, (b) the amounts of each if the component if the components are unknown. These techniques offer an excellent means for preprocessing multicomponent fluorescence data to achieve an efficient dimensionality reduction for input to pattern recognition programs which seek to identify the source of the oil. (See also W78-08934) (Sinha - OEIS)
W78-08948

CONTOUR LUMINESCENCE SPECTRA AND THEIR INTERPRETATION,
Baird-Atomic, Inc., Bedford, MA.
A. W. Hornig.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 136-150, 9 fig, 3 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, Fluorescence phosphorecene, Oil pollution, *Luminescence.

Luminescence (Fluorescence and Phosphorescence) has become an increasingly important tool for monitoring and identification of oil, toxic and hazardous materials, and biological materials. The full utility of luminescence analysis requires the assimilation and interpretation of the total luminescence data, i.e., the observed intensity as a function of all possible excitation and emission wavelengths. Traditionally this is approximated by visual comparison and interpretation of selected excitation and emission spectra. This approach is slow and inefficient, since the data are too numerous for complete assimilation by eye. Data interpretation may be approached from a general pattern recognition point of view, but there is also room for a less general, more intuitive approach which stresses those characteristics of luminescence spectra which differentiate them from general abstract patterns. This latter approach is stressed while awaiting development of more general methods. The use of contour difference spectra for oil analysis is discussed. (See also W78-08934) (Sinha - OEIS)
W78-08949

PATTERN RECOGNITION OF OUTPUT FROM GC-MS-COM FOR CRUDE OIL CLASSIFICATION,
Exxon Production Research Co., Houston, TX.; and Spectrix Corp., Houston, TX.
C. B. Koons, M. A. Rogers, J. N. Mercer, D. A. Flory, and A. E. Rubenstein.
In: Proceedings of a Workshop on Pattern Recognition Applied to Oil Identification, held at Coronado, Calif. on November 11-12, 1976. IEEE Catalog No. 76CH1247-6C, 1977. p 151-161, 5 fig, 10 ref.

Descriptors: *Oil spills, *Pollutant identification, Water pollution sources, *Gas chromatography, *Mass spectrometry, Oil pollution, *Crude oil, *Pattern recognition(Oil wastes), Ion monitoring.

Until recently geochemical methods for crude oil characterization and classification into genetically related families have been based on such techniques as determination of stable carbon isotope ratios on selected fractions, analyses of individual hydrocarbons in the low molecular weight range, and of classes of hydrocarbons in the high molecular weight range. Subsequent application of pattern recognition techniques, such as factor and discriminant function analyses, have been used to evaluate and simplify the immense amount of data collected through these analyses. This paper presents a new effort in the identification of oils involving the use of computerized gas chromatograph mass spectrometry (GC-MS-COM). Selected fractions have been analyzed by GC-MS and their fingerprints plotted by computer. Specific ions indicative of indigenous biological markers have been monitored. Preliminary indications are that this technique of selective ion monitoring should prove useful in the correlation of crude oils. (See also W78-08934) (Sinha-OEIS)
W78-08950

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-08960

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VII. INHIBITION OF NITROGEN ASSIMILATION AND AMMONIA REGENERATION BY PLANKTON IN SEAWATER SAMPLES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-08961

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VI. DENITRIFICATION BY MARINE BACTERIA,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W78-08962

STUDIES IN COPPER METABOLISM IN FISHES - III. EXISTENCE OF METALLOTHIONEIN-LIKE PROTEIN IN CARP HEPATOPANCREAS (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W78-08963

ACIDIC PRECIPITATION IN SOUTH-CENTRAL ONTARIO: RECENT OBSERVATIONS,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
P. J. Dillon, D. S. Jeffires, W. Snyder, R. Reid, and N. D. Yan.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 6, p 809-815, June 1978. 1 fig, 4 tab, 35 ref.

Descriptors: *Rainfall, *Acidity, *Lakes, *Streams, *Canada, Surveys, Sampling, Chemical analysis, Hydrogen ion concentration, Precipitation(Atmospheric), Alkalinity, Acids, Chemistry of precipitation, Air pollution, Water pollution, *Ontario, *Acidic rain, Buffering capacity.

Precipitation in south-central Ontario, with mean pH between 3.95 and 4.38 and frequent event pH's of less than 4.0, is more acidic than that in the Sudbury, Ontario, region and in Scandinavia, and as acidic as that in the northeastern USA. As in New England, a major component of the total acidity is strong mineral acid. Because most lakes in south-central Ontario have very low buffering capacities (10-200 micro eq/L), high acid loadings are likely to lead to acidification of many lakes and streams in the forseeable future. Although it is not yet possible to estimate the time required for this to happen, there is already some evidence of declining buffering capacity in a few lakes. (Sims-ISWS)
W78-09051

ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1976,
Illinois State Water Survey, Urbana.
S. D. Lin, R. L. Evans, and D. B. Beuscher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 462, Price codes: A03 in paper copy, A01 in microfiche. Report of Investigation 86, 1978. 41 p, 1 fig, 6 tab, 25 ref.

Descriptors: *Illinois, *Aquatic algae, *Streams, *Data collections, Natural streams, Water quality, Scenedesmus, Aquatic life, Algae, Diatoms, Sampling, Density, On-site investigations, Testing procedures, Methodology, Analytical techniques,

Analysis, Algal composition, Algal succession, Diversity index.

During the 5-year period, October 1971 through September 1976, samples of water from 21 Illinois streams at 26 locations were collected monthly and examined to determine the concentration and genera of algae. Data were evaluated for algal composition, density, diversity indices, and seasonal succession for each stream location. At most sampling locations, algal densities ranged from 500 to 2000 cts/ml. The 5-year geometric means extended from 880 to 1500 cts/ml. From 24 to 30 different algal genera were recovered for each station and, in all, 56 genera were detected. The average diversity index for each station ranged from 1.11 to 1.36 bits per individual. The highest density of 60,000 cts/ml occurred on July 11, 1975, in the Fox River at Algonquin. The diatoms Navicula and Cyclotella were the most frequently observed algae. In addition to these, the green algae Scenedesmus and Crucigenia and the diatom Melosira were often dominant. From sample to sample, season to season, and year to year, the genera found at any sampling station varied considerably. Generally, the annual maximum population occurred in the spring. However, the experience gained from this study supported the conclusion that it is possible to predict algal density, composition, or succession in the flowing streams of Illinois. (Humphreys-ISWS)
W78-09060

THE TOXICITY OF THE RIOT CONTROL AGENT CS (O-CHLOROBENZYLIDENE MALONONITRILE) AND ITS HYDROLYSIS PRODUCTS TO THE MUMMICHOG, FUNDULUS HETEROCLITUS (LINNAEUS),
Edgewood Arsenal, Aberdeen Proving Ground, MD. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W78-09063

A PRE-IMPOUNDMENT WATER QUALITY INVESTIGATION FOR THE PROPOSED GATHRIGHT RESERVOIR.
Environmental Protection Agency, Philadelphia, PA. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 124, Price codes: A04 in paper copy, A01 in microfiche. June 1973, 48 p, 5 fig, 4 tab, 6 ref, 8 append.

Descriptors: *Environmental effects, *Impoundments, *Rivers, *Multiple purpose reservoirs, *Water quality, Virginia, Nutrients, Eutrophication, Dissolved oxygen, Bacteria, Potable water, Standards, Population, Industries, Biological properties, Chemical properties, Agricultural watersheds, Forest watersheds, Water supply, *Gathright Reservoir(VA), *Jackson River(VA), Downstream effects, Waste sources.

The proposed impoundment will be located on the Jackson River in west-central Virginia, draining 344 square miles of agricultural and forest land. Population densities are low and no industries or large municipalties are located in the drainage basin. Designed by the U.S. Corps of Engineers to provide for flood control, flow augmentation, recreation and a downstream cold water fishery, the reservoir will cover 2530 acres of maximum pool. The study summarizes the physical and chemical characteristics of the Jackson River Basin waters and then inventories the basin's biological characteristics. Conclusions are that nutrient concentrations are not great enough to cause any post-impoundment eutrophication; population trends are such that the region will retain a minimum population density with no industrial development; thermal stratification will occur in the lake along with deoxygenation of bottom waters, and since the outflow is scheduled to be multi-outlet, no low dissolved oxygen problems below the dam are anticipated; and bacterial content will be 'desirable' rather than the higher 'permissible' levels listed for drinking water standards, although this is not expected to affect contact recreation. (Zayac-NC)
W78-09072

EVALUATION OF A WATER ANALYSIS KIT,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Journal of Environmental Quality, Vol. 6, No. 4, p 381-384, October-December, 1977. 3 tab, 10 ref.

Descriptors: *Laboratory tests, *Laboratory equipment, Water analysis, Water chemistry, Water pollution, Water pollution control, Water quality, Water quality control, *Pollutant identification.

A Hach DR-EL/2 Direct Reading Engineer's Laboratory Kit was evaluated by comparison to standard analytical methods. Results of Hach kit methods were highly correlated with concentrations of standard solutions. The y-intercepts (1) did not differ from 0 for most methods, but for 11 methods regression coefficients (2) differed from 1.0. For each of the 20 parameters, three natural water samples were analyzed seven times by Hach kit and by the standard method. Mean values obtained by the two analytical systems were usually significantly different and the standard method sometimes gave higher precision from the Hach kit. Nevertheless, the Hach kit usually gave close approximations of values obtained by standard methods. Comparisons also included analyses of a large series of natural water samples. Correlation coefficients between Hach kit and standard methods were often greater than 0.99. Although a = 0 for 14 methods, b = 1.0 for only eight methods. Reliability of the Hach kit was adequate for general surveys of water quality, fisheries management decisions, and research requiring only approximate data on water quality. (Skogerboe-Colorado State)
W78-09111

LACK OF CORRELATION BETWEEN THE COMPOSITION OF SEDIMENTS AND THEIR TOXICITY TO ALGAE,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
P. Hannan, C. Patouillet, and D. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 528, Price codes: A02 in paper copy, A01 in microfiche. Report 8019, August 1976. 18 p, 4 fig, 5 tab, 19 ref.

Descriptors: *Pollutant identification, *Algae, *Sediments, *Toxicity, *Bioassay, *Standard Elutriate Test, *Methodology, *Heavy metals, Phaeodactylum tricornutum, Hydrogen ion concentration, Carbon dioxide, Chlorophyll, Plant growth, Soils, Washington, Hood Canal(WA), Bangor Annex(WA), Lead, Copper, Zinc, Cadmium, Dredging, Spoils, Waste disposal.

Algal bioassay proved more suitable for determining toxicity of sediment samples than the Standard Elutriate Test, the presently used test method. Sediment and soil samples from 12 sites in the Trident submarine base under development at Bangor Annex, Washington, on the Hood Canal and three from California coastal waters were used in the tests. Analyses for 24 elements were made on the samples, and for lead, cadmium, copper, and zinc on the algal cells cultured in nutrient-enriched extracts of the samples. Although some of the samples were toxic according to the algal assay, there was almost no correlation between concentrations of lead, copper, zinc in the algal cells and those in test samples; no data was available on the cadmium content of the soil and sediment samples. It is concluded that the Standard Elutriate Test, based on chemical analyses of sediment elutriates, has limited value; more meaningful data can be obtained from bioassay. To deal with the problem of measuring algal growth continuously, a procedure developed in which the carbon dioxide uptake of algae was measured hourly by automatic monitoring of pH. Fluorescence was also measured, providing an indication of chlorophyll content of the algal cells. The assay organism was Phaeodactylum tricornutum. The study was undertaken in connection with naval dredging operations and subsequent spoils disposal. (Lynch-Wisconsin)
W78-09160

PREIMPOUNDMENT AND IMMEDIATE POST IMPOUNDMENT ADENOSINE TRIPHOSPHATE CONCENTRATIONS IN SOUTHERN INDIAN LAKE: 1975, 1976,
Fisheries and Marine Servie, Winnipeg (Manitoba).
S. Guildford.
Fisheries and Marine Service Technical Report No. 749, December 1977. 15 p, 3 fig, 2 tab, 10 ref.

Descriptors: *Pre-impoundment, *Post-impoundment, *Southern Indian Lake(Manitoba Canada), Impoundments, *Adenosine triphosphate, *Indicators, *Phytoplankton, *Zooplankton, Reservoirs, Hydroelectric power, Nelson River(Canada), Churchill River(Canada), Biomass, Dams, Plankton, Algae, Bays, Diversion, Water levels, Lakes, Water management(Applied), Rivers, Pollutant identification.

Adenosine triphophate (ATP) concentrations, which monitor changes in planktonic biomass, were used to measure environmental effects of impoundment of Southern Indian Lake (Manitoba, Canada) and diversion of the Churchill River. The lake's level was raised and its water diverted into the Nelson River drainage system to augment hydroelectric capacity of the Nelson River. ATP in 1976 more than doubled over the 1975 levels at two stations in South Bay after diversion of the Churchill River through the bay. Size fractionation of ATP revealed a shift in size distribution of planktonic biomass from 1975 to 1976. A detailed study of ATP levels in Long Bay, a seven-sq km area on the 2530-sw km lake, showed low spatial variability there. Distribution of mean total ATP in the lake indicated strong influence of the flow of the Churchill River. ATP is a rapid and relatively reliable method of estimating planktonic biomass. Between 1973 and 1975 coffer and control dams were constructed south of Notigi Lake, cutting off flow of the Rat River. In 1974-75 similar dams were built at Missi Falls to regulate Churchill River outflow from Southern Indian Lake. In June 1976 a man-made channel was completed connecting South Bay to Isset Lake, and the Rat River was again permitted to flow through Notigi Lake. In July-August 1976 regulation by the Missi Falls dam initiated flow out of the diversion channel. (Lynch-Wisconsin)
W78-09161

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUALIFICATION,
National Aeronautics and Space Asministration, Langley Station, VA. Langley Research Center.
E. V. Browell.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-26480, Price codes: A03 in paper copy, A01 in microfiche. NASA Technical Note D-8447, June 1977. 39 p, 16 fig, 5 tab, 30 ref. 176-20-32-07.

Descriptors: *Pollutant identification, *Lasers, *Fluorosensors, *Algae, *Remote sensing, *Chlorophyll, Fluorescence, Primary productivity, Rhodophyta, Chlorophyta, Cyanophyta, Phaeophyta.

The development and use of single- and multiple-wavelength laser fluorosensor systems in remote detection and quantification of algae are

discussed, as well as the importance of algae and algal measurements, and the spectral characteristics of algae. An equation for fluorescence power received by a laser fluorosensor system is derived in detail; results differ by as much as a factor of 10 from those reported by other studies. The multiple-wavelength system is capable of selectivity exciting algae in the four primary algal color groups: green, golden-brown, red, and blue-green. A comprehensive error analysis is reported which evaluates the uncertainty in reote determination of chlorophyll-a concentration by laser fluorosensor systems. Factors which can greatly affect the fluorescence cross-section of algae include long- and short-run light history, and nutrient and age effects. Results of the error analysis indicate that remote quantification of chlorophyll-a by a laser fluorosensor system requires optimum excitation wavelengths, remote measurement of marine attenuation coefficients, and supplemental instrumentation. In these systems, the laser excites the chlorophyll-a pigment in the algae, and a collocated telescope receiver detects the emitted fluorescence at 685 nm. The system can be used as night and when there is a high-altitude cloud cover, and can distinguish the algal color groups, in contrast to passive techniques relying on spectral characteristics of reflected sunlight. (Lynch-Wisconsin)
W78-09166

EFFECT OF CADMIUM OF ALKALINE PHOSPHATASE ACTIVITY IN DIFFERENT TISSUE OF LEPOMIS GIBBOSUS L. (PISCES; CENTRARCHIDAE) (IN FRENCH),
Lab. Invest. Endocrinol., Kain (Belgium).
For primary bibliographic entry see Field 5C.
W78-09175

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF BASUDIN IN WATER BODIES (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Inst. Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
I. B. Boiko, and B. A. Pulatov.
Gig Sanit 8, p 105-107, 1977.

Descriptors: *Insecticides, *Lethal limit, *Basudin, *Water quality standards, *Organophoric compounds, Toxicity.

A series of tests were made to determine the permissible water levels of basudin (insecticide), a highly-effective organophosphoric compound used to control of basudin and the sanitary condition of water bodies, as well as results of toxicological studies (the non-active dose in chronic 10 mo. experiments on albino rats was 0.48 mg/kg), permits recommendation of the permissible dose of 0.3 mg/l in water bodies, which is the organoleptically limited index of harmfulness.--Copyright 1978, Biological Abstracts, Inc.
W78-09181

SEASONAL VARIATIONS OF TRITIUM AND OTHER CONSTITUENTS IN GROUNDWATER IN THE CHALK NEAR BRIGHTON, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
R. A. Downing, D. B. Smith, and S. C. Warren.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 2, p 123-136, March 1978. 4 fig, 4 tab, 10 ref.

Descriptors: *Tritium, *Ground water, *Variability, *Water quality, *Radioisotopes, Fallout, Hydrogen, Radioactivity, Fluctuations, Aquifer characteristics, Ground water movement, Groundwater resources, Water wells, Base flow, Tracers, Sampling, Analytical techniques, *Brighton(England), Chalk aquifer study.

Tritium and several other chemical parameters were measured at monthly or more frequent intervals between July 1973 and June 1975 in three wells in the Chalk near Brighton. The data indicated that recharge of groundwater in the Chalk is by rapid transit of water through macrofissures and by piston displacement of water in the microfissures and larger pores of the unsaturated zone. In general, about 10% of the total recharge is transported rapidly through the unsaturated zone. The results supported the view that tritium and other solutes diffuse into the Chalk matrix from water moving slowly in the microfissures and larger pores. The Beta-activity of the groundwater appeared to reach maximum values 7 years after peak values in rainfall. It was suggested that this is due to the delay in the flow of groundwater from the less permeable areas into the more permeable peripheral parts of the aquifer. The groundwater consists of at least two components: a recent water, replenished and discharged seasonally, and an older 'base flow' component which includes 10% derived from post-1953 rainfall. (Henley-ISWS)
W78-09210

CONTRIUBITON TO A METHOD FOR CALCULATING THE EXPECTED MINERALIZATION OF RESERVOIR WATER,
For primary bibliographic entry see Field 2H.
W78-09221

MODIFICATIONS OF CONTINUOUS-FLOW TOXICITY TEST METHODS FOR SMALL AQUATIC ORGANISMS,
Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center.
A. W. Maki.
The Progressive Fish Culturist, Vol. 39, No. 4, p 172-174, October 1977. 2 fig, 1 tab, 3 ref.

Descriptors: *Toxicity, *Bioassay, *Methodology, Bioindicators, Pollutant identification, *Daphnia, *Equipment, Laboratory tests, Water Quality Standards, Invertebrates, Analytical techniques, Water quality, Larvae, Laboratory equipment, *Continuous-Flow Tests.

Modifications of the standard proportional diluter are described for the continuous-flow toxicity testing of small aquatic organisms; the modifications provide for a 95% water volume replacement time of 2.5 h or less, with no perceptible current-induced effects on the test individuals. The system permits the automatic introduction of known concentrations of food at each diluter cycle and has application to the testing of pelagic invertebrates or larval fish. (EIS-Katz)
W78-09286

BIOCIDES IN RELATION TO WATER POLLUTION PART I: BIOASSAY STUDIES ON THE EFFECTS OF A FEW BIOCIDES ON FRESH WATER FISH, CHANNA GACHUA,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-09293

PHOTOSYNTHESIS/RESPIRATION RATIOS IN AQUATIC MICROCOSMS UNDER ARSENIC STRESS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-09297

ACUTE EFFECTS OF WOOD-PULP ON SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W78-09299

CONCENTRATION OF THREE METALS IN OYSTERS (CRASSOSTREA VIRGINICA) OF BILOXI AND PASCAGOULA, MISSISSIPPI ESTUARIES,
Jackson State Coll., MS. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-09300

5B. Sources Of Pollution

INTRA-ANNUAL VARIATIONS IN THE CONCENTRATION OF BIOGENIC ELEMENTS AND DISSOLVED GASES IN THE EASTERN PART OF THE BALTIC SEA,
T. S. Komarova, Yu. N. Sergeyev, O. P. Savchuk, B. F. Drobyshev, and A. V. Grigor'yev.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 334-339, 1976. 2 fig, 1 tab, 9 ref. Translated from Vestnik Leningradskogo Universiteta, No. 18, p 118-129, 1976.

Descriptors: *Marine biology, *Water pollution, *Surveys, Data processing, *Dissolved oxygen, Salinity, Carbon dioxide, Nitrates, Nitrites, Phosphates, Silicates, Water temperature, Sampling, Chemicals, Biology, *Baltic Sea.

One of the most important tasks of marine sciences is to develop scientific recommendations for the rational use of the biological resources of the ocean and for pollution control of this medium. Successful solution of these problems requires, qualitative and quantitative analysis of physical-dynamic, hydrochemical, and hydrobiological processes in the ocean from the viewpoint of systems theory. Field data required for simulating a specific marine biogeocenosis were collected in 1972-1973 by an expedition of the Oceanology Department of Leningrad State University in the eastern part of the Baltic Sea. An analysis of these observations was performed for the purpose of describing the main characteristics of the seasonal variations of the components of the hydrochemical complex of the biogeocenosis investigated. Isopleths of the seasonal variations of temperature, salinity, relative oxygen content, partial carbon dioxide pressure, and of the concentrations of nitrites, nitrates, phosphates, and silicic acid were presented. The seasonal dynamics of all the hydrochemical characteristics observed were generally typical of the seas of temperate latitudes, particularly of the shallow areas of the eastern part of the Baltic Sea under the strong effect of coastal runoff. Processes of organic-matter breakdown and mineralization involve the entire water column, including the surface layers, throughout the year. This promotes the virtually continuous extension of the growing period, which begins in April and lasts to the end of September-early October. (Sims-ISWS)
W78-08816

PRECIPITATION INPUTS OF PCBS TO LAKE MICHIGAN,
Paul Univ., Chicago, IL. Dept. of Chemistry.
T. J. Murphy, and C. P. Rzeszutko.
Journal of Great Lakes Research, Vol 3, No 3-4, p 305-312, December 1977. 3 fig, 2 tab, 32 ref. EPA 803915.

Descriptors: *Great Lakes, *Fallout, *Water pollution sources, *Lake Michigan, *Polychlorinated biphenyls, Precipitation(Atmospheric), On-site data collections, Pollutants, Sampling, Analysis, Rainfall, Analytical techniques, Instrumentation, *Beaver Island(Mich).

Event precipitation samples were collected in Chicago, Illinois, and on Beaver Island, Michigan, and were analyzed for polychlorinated biphenyls (PCBs). The weighted mean concentration of PCBs in 31 samples of rain was 119 ng/L, which indicates a deposition of 5,000 kg/yr of PCBs to Lake Michigan from wet precipitation. The concentrations of PCBs in rainfall were found to be as

high on Beaver Island as in Chicago, which was interpreted as indicating that the sources of PCBs to the atmosphere are diffuse and/or that residence times in the atmosphere are long. Precipitation is now the major source of these materials to the lake, and future problems in the lake with PCBs will be determined mainly by the magnitude of the atmospheric inputs of PCBs to the lake. (Humphreys-ISWS)
W78-08823

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
J. Soren.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 401, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-77, 1978. 22 p, 4 fig, 3 tab, 5 ref.

Descriptors: *Groundwater resources, *Water quality, *Water supply, *Aquifer characteristics, *Water pollution sources, Saline water intrusion, Septic tanks, Cesspools, Infiltration, Pumping, Water wells, Drawdown, Hydrogeology, New York, *Long Island, *Shelter Island.

Shelter Island, an area of about 11 square miles, in Suffolk County, N.Y., is situated between the north and south forks of eastern Long Island. The upper glacial aquifer is the sole source of freshwater supply for Shelter Island's population, which currently ranges seasonally from 2,000 to 8,000. Fresh ground water seems to be limited to sand and gravel deposits in the aquifer, which is thin and can be readily infiltrated by surrounding saline ground water. The aquifer is underlain by confining clay formations that contain saline water, and the geologic formations below the clay probably contain saline water also. The fresh ground water is mostly soft and has low dissolved-solids concentrations; however, several wells near shorelines have yielded excessive amounts of chloride. Man-induced contamination of the aquifer is evident but not severe, as shown by somewhat elevated concentrations of nitrate nitrogen and methylene blue active substances (MBAS). Increased pumping will cause deterioration of the fresh ground-water supply by inducing saline-water infiltration and by adding greater volumes of septic-tank and cesspool effluents to the aquifer. Test drilling could help in water-supply management by determining the extent of the aquifer and of fresh ground-water storage, and observation wells could provide early detection of saline-water infiltration. (Woodard-USGS)
W78-08839

REAERATION CAPACITY OF THE ROCK RIVER BETWEEN LAKE KOSHKONONG, WISCONSIN AND ROCKTON, ILLINOIS,
Geological Survey, Madison, WI. Water Resources Div.
R. S. Grant.
Water-Resources Investigations 77-128, March 1978. 33 p, 18 fig, 3 tab, 21 ref.

Descriptors: *Path of pollutants, *Streams, *Tracking techniques, *Dye releases, *Discharge(Water), Streamflow, Flow rates, Model studies, Forecasting, Dissolved oxygen, Aeration, Open channel flow, Evaluation, Wisconsin, Illinois, *Rock River, *Stream reaeration capacity.

The reaeration capacity of the Rock River from Lake Koshkonong, Wisconsin, to Rockton, Illinois, was determined using the energy-dissipation model. The model was calibrated using data from radioactive-tracer measurements in the study reach. Reaeration coefficients (K2) were computed for the annual minimum 7-day mean discharge that occurs on the average of once in 10 years (Q7,10). A time-of-travel model was developed using river discharge, slope, and velocity data from three dye studies. The model was used to estimate traveltime for the Q7,10 for use in the energy-dissipation model. During one radiotracer study, 17 mile per hour winds apparently increased the reaeration coefficient about 40 times. (Woodard-USGS)
W78-08840

CHEMICAL QUALITY OF GROUND WATER IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-08841

TROPHIC CONDITIONS IN LAKE WINNISQUAM, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-08842

GEOHYDROLOGIC EVALUATION OF A LANDFILL IN A COASTAL AREA, ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. B. Hutchinson, and J. W. Stewart.
Water-Resources Investigations 77-78, February 1978. 40 p, 12 fig, 4 tab, 16 ref.

Descriptors: *Landfills, *Leachate, *Path of pollutants, *Groundwater, *Florida, Hydrogeology, Water quality, Aquifer characteristics, Solid wastes, Sludge, Domestic water, Water supply, Evaluation, Pinellas County(Fla).

The 250-acre Toytown landfill site is in a poorly-drained area in coastal Pinellas County, Florida. Average altitude of land surface at the landfill is less than 10 feet. About 1000 tons of solid waste and about 200,000 gallons of digested sewage sludge are disposed of daily at the landfill. The velocity of ground-water flow through the 23-foot thick surficial aquifer northeast from the landfill toward Old Tampa Bay probably ranges from 1 to 10 feet per year, and downward velocity through the confining bed is about 0.00074 foot per day. The horizontal and vertical flow velocities indicate that leachate moves slowly downgradient, and that leachate has not yet seeped through the confining bed after 12 years of landfill operation. Untreated surface run-off from the site averages about 15 inches per year, and ground-water outflow averages about 3.3 inches per year. The Floridan aquifer is used as a limited source of water for domestic supply in this area. (Woodard-USGS)
W78-08849

WATER-QUALITY CONDITIONS IN SOUTHERN ROCKINGHAM COUNTY, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.; and Southern Rockingham Regional Planning District Commission, Salem, NH.
W. D. Silvey, and R. L. Wheeler.
Open-file report 78-224, March 1978. 51 p, 27 fig, 5 tab, 10 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Water pollution sources, Waste disposal, Data collections, Sampling, Chemical analysis, Nutrients, Dissolved solids, Pesticides, Coliforms, Polychlorinated biphenyls, Bottom sediments, *New Hampshire, Southern Rockingham County(NH).

Physical, chemical, and biological characteristics of water were measured at 26 surface-water sites, 17 ground-water sites, and in effluent from two sanitary landfills as part of planning for area-wide waste management in four watersheds within the Southern Rockingham Regional Planning District in Southern New Hampshire. Dissolved minerals concentration in water at all but one of 26 surface-water-sampling sites is low and within recommended limits of the U.S. Environmental Protection Agency. Water at the 26 surface-water-sampling sites generally was enriched with nitrogen and phosphorus and contained at least some coliform bacteria, indicating contamination, probably from waste disposal systems. PCBs (polychlorinated biphenyls) and pesticides were not present in the water, but small amounts of DDE, DDD, dieldrin, chlordane, and heptachlor were present in stream-bottom materials at 11 of the 26 sites, and PCBs were present at 7. Iron and manganese were present in concentrations that in some cases exceeded recommended limits. Coliform bacteria were present at 5 of the 17 ground-water-sampling sites; concentrations of iron exceeded recommended limits at 8 sites, and manganese exceeded recommended limits at 9 sites. PCBs and pesticides were not present in any samples collected at the ground-water-sampling sites. (Woodard-USGS)
W78-08858

WATER-QUALITY ASSESSMENT OF THE MUDDY FORK SILVER CREEK WATERSHED, CLARK, FLOYD, AND WASHINGTON COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
M. A. Hardy.
Open-file report 78-202, February 1978. 41 p, 8 fig, 7 tab, 23 ref.

Descriptors: *Water quality, *Water pollution sources, *Streams, *Indiana, Evaluation, Water analysis, Chemical analysis, Pesticides, Domestic wastes, Municipal wastes, Bacteria, Coliform, Phytoplankton, Dissolved solids, Regulated flow, Reservoir releases, Bottom sediments, *Muddy Fork Silver Creek watershed, Clark County, Floyd County, Washington County.

Data collected for a wide range of flow conditions from September 8, 1975, to July 13, 1976, reveal that human and animal waste loading of streams and pesticides use in the Muddy Fork Silver Creek watershed, Indiana, are probably the most significant water-quality problems. Generally, the type(s) of water in tributary streams in the south and southwest parts of the watershed was calcium bicarbonate and in other tributaries were calcium sulfate and magnesium sulfate. Dissolved-solids concentrations of discharge from top-spill reservoirs were lower and more consistent over a range of flows than concentrations from uncontrolled streams. Concentrations of fecal coliform bacteria and fecal streptococcal bacteria ranged from 5 to 65,000 colonies per 100 milliliters and from 5 to 14,000 colonies per 100 milliliters, respectively. Data on periphyton, phytoplankton, and benthic communities collected during low flow in September 1975 indicate organic loading of Muddy Fork downstream from the town of Speed. Phytoplankton community structures varied temporally and spatially. Ranges of concentration (In micrograms per kilogram) of various chlorinated hydrocarbons in samples of bed materials were: chlordane, from 0 to 14; DDT, from 0 to 19; and PCB's, from 0 to 11. Concentrations of aldrin, DDD, DDE, heptachlor, and heptachlor epoxide of 5.1 micrograms per kilogram or less were also detected. The presence of these compounds makes them potentially available for accumulation in the biological food chain. (Woodard-USGS)
W78-08859

CHEMISTRY AND BIOLOGICAL HAZARD OF A COAL ASH SEEPAGE STREAM,
Oak Ridge National Lab., TN.
C. C. Coutant, C. S. Wasserman, M. S. Chung, D. B. Rubin, and M. Manning.
Journal of the Water Pollution Control Federation, Vol 50, p 747-53, 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Coal mine wastes, *Acidic water, *Seepage, Toxicity, Coal mines, Hydrogen ion concentration, Water quality, Tennessee, Environmental effects, Chemistry, Iron, Silts, Sulfates, Industrial wastes, Mortality, Catfishes, Metals, Sampling, Analytical techniques, Thermal pollution, Electric powerplants, Tennessee, *Coal ash, Clinch River(Tenn).

Water seeping through coal ash settling pond produced a seepage effluent that was acidic (pH 3.2 or less) and high in sulfate and iron. Dissolved ferrous iron predominated in the upper end of the seepage ditch, but partially transformed to ferric ion and a ferric hydroxide/FeOOH precipitate. When discharged to the Clinch River, the iron remaining in solution precipitated immediately at the pH of river water (about 7.9). The large amounts of iron silt were lethal to juvenile catfish near the discharge, but not beyond a few meters. (EIS-Klein)
W78-08862

THE DISTRIBUTION OF METHYL MERCURY IN CONTAMINATED SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, GA.
W. S. Gardner, D. R. Kendall, R. R. Odom, H. H. Windom, and J. A. Stephens.
Environmental Pollution, Vol 15, p 243-251, 1978. 1 fig, 6 tab, 19 ref.

Descriptors: *Mercury, *Metals, *Ecosystems, *Marshes, Water pollution sources, Path of pollutants, Sediments, Biota, Plants, Aquatic life, Industrial wastes, Food chains, Biological communities, Analytical techniques, *Methyl mercury, Bioaccumulation, Tissue analysis.

Elevated levels of mercury occurring in a polluted marsh ecosystem as a result of industrial discharge were relected in the sediment and in most biota from the region. The predominant form of the metal varied in different components of the ecosystem examined. Most Hg in sediments and plants were not methylated (less than 0.002 ppm), whereas in higher trophic level organisms (mammals, birds, fish), Hg existed mainly as methyl mercury (less than 1-60 ppm). Tissues of animals which feed on plants and detrital meterial in the sediments tended to contain lower, burt measurable, concentrations of MeHg. (EIS-Klein)
W78-08863

UPTAKE OF POLYCHLORINATED BIPHENYL (AROCLOR 1254) FROM SEDIMENT AND FROM SEAWATER IN TWO INTERTIDAL POLYCHAETES,
London Univ. (England). Dept. of Zoology.
W. A. M. Courtney, and W. J. Langston.
Environmental Pollution, Vol 15, p 303-309, 1978. 2 fig, 2 tab, 19 ref.

Descriptors: *Aroclors, *Absorption, *Worms, Invertebrates, *Polychlorinated biphenyls, Sediments, Water quality, Benthic fauna, Metabolism, Water pollution, Laboratory tests, Path of pollutants, Water pollution effects, *Aroclor 1254, *Polychaetes, Bioaccumulation.

The intertidal polychaetes Arenicola marina and Nereis diversiocolor accumulated similar body residues whether held in 1 ppm Aroclor 1254 in sand or in 1.1 microgram/liter 1254 in seawater, indicating no evidence that benthic infauna of polluted areas are more contaminated as a result of these insoluble pollutants adsorbing to their particulate habitat. However, fine sediments were found to sequester all of the pollutants when shaken with seawater in the laboratory. This indicated that benthic polychaetes would become contaminated in less polluted conditions in the field and that short-term experiments would indicate persistent loads of PCB. Intertidal polychaetes of the Norfolk coast showed similar levels of PCB contamination to other species in the North Sea. (EIS - Klein)
W78-08865

IRON IN MAINE COASTAL WATERS; SEASONAL VARIATION AND ITS APPARENT CORRELATION WITH A DINOFLAGELLATE BLOOM,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
H. E. Glover.
Limnology and Oceanography, Vol 23, No 3, p 534-537, 1978. 5 fig, 12 ref.

Descriptors: *Iron, *Metals, *Seasonal, *Phytoplankton, *Dinoflagellates, Gymnodium, Primary productivity, Aquatic productivity, Water pollution sources, Environmental effects, Water quality, *Maine, Cycling nutrients, Population, Path of pollutants, Runoff, Growth rates, *Boothbay Harbor(Maine).

During 1975, 12 km south of Boothbay Harbor, soluble iron concentrations in the first 20 m of water were three times greater in October and November than in August and September, while particulate iron concentrations only inreased transiently before the fall bloom. Nutrient enrichment experiments and chlorophyll a:cytochrome f1 ratios indicated that low iron concentration limited phytoplankton populations. In August 1976, 1-4 km from Monhegan Island, increased iron concentrations from land runoff preceeded a dinofagellate bloom. (EIS - Klein)
W78-08866

LARVAL FISH DRIFT IN A LARGE RIVER WITH A COMPARISON OF SAMPLING METHODS,
Ichthyological Associates, Inc., Berwick, PA.
For primary bibliographic entry see Field 5A.
W78-08867

MARINE ENVIRONMENTAL IMPACT DUE TO MINING ACTIVITIES OF EL SALVADOR COPPER MINE, CHILE,
Universidad Catolica de Chile, Santiago. Lab. de Zoologia.
J. C. Castilla, and E. Nealler.
Marine Pollution Bulletin, Vol 9, No 3, p 67-70, 1978. 1 fig, 2 tab, 21 ref.

Descriptors: *Copper, *Mining, *Mine wastes, *Sediments, *Suspended solids, Unconsolidated sediments, *Mortality, *Molybdenum, *Benthos, Water pollution sources, Metals, Arsenic compounds, Water pollution effects, Benthos, Marine animals, Chile(El Salvado Copper Mine).

The dumping of untreated mine wastes into a coastal bay was found to have hindered harbor activities, caused geomorphological coastal modifications and seriously affected marine coastal ecosystems and recreational activities. Tailing discharges are accumulating at the rate of 25,000 tons of fine sediments per day. Marine organisms are inhibited by the unstable benthic habitat, the poor light penetration due to suspended solids, and the presence of large quantities of copper, arsenic, and other chemicals in the discharges. (EIS-Deal)
W78-08869

MUSSEL MORTALITY IN THE GULF OF LA SPEZIA, ITALY,
Atkins Research and Development, Epson (England).
For primary bibliographic entry see Field 5C.
W78-08872

MOLECULAR STRUCTURE - BIOLOGICAL PROPERTIES RELATIONSHIPS IN ANIONIC SURFACE-ACTIVE AGENTS,
Institut National de Recherche Chimioue Appliouee, Vert-le-Petit (France).
For primary bibliographic entry see Field 5C.
W78-08873

ZINC CONTENT IN OTOLITHS OF MACKEREL FROM THE AEGEAN,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5A.
W78-08876

MONITORING POLLUTION.
Surveyor, Vol. 151, No. 4469, p 22, February, 1978.

Descriptors: *Monitoring, *Instrumentation, *Dissolved oxygen, *Temperature, *Electrodes, Data collections, On-site data collections, Measurement, Hydrologic data, Water pollution, Water pollution sources, Thermal pollution.

A dissolved oxygen and temperature monitor has been developed by pHOX Systems Ltd. of Baldock, Herfordshire, England. The Series 67 measures and records the dissolved oxygen data in percent saturation or mg/liter. The selfcontained, waterproof unit was designed for remote field stations and waste water treatment plant trials. The unit is operated by an internally-mounted cell with a one-month power supply; overnight recharging restores the one-month power supply. Dissolved oxygen and temperature levels are measured by a patented cartridge-type pHOX Mackereth electrode. The inkless 'chopper bar' type recorder for maintaining oxygen and temperature values is available with a variety of chart speeds. (Lisk-FIRL)
W78-08878

DISPOSAL IN THE MARINE ENVIRONMENT: AN OCEANOGRAPHIC ASSESSMENT.
National Research Council, Washington, DC. Ocean Disposal Study Steering Committee.
For primary bibliographic entry see Field 5G.
W78-08886

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
W. D. MacLeod, Jr., D. W. Brown, R. G. Jenkins, L. S. Ramos, and V. D. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 591, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Report No EPA-600/7-77-098, September 1977. 63 p, 5 fig, 12 tab, 2 append. Also as: NOAA Technical Memorandum ERL MESA-8.

Descriptors: *Water pollution sources, *Baseline studies, *Pollutant identification, *Oil pollution, Washington, Monitoring, *Outer Continental Shelf, Petroleum hydrocarbons, Aromatic hydrocarbons, Tanker traffic.

Hydrocarbon baseline data are needed to assess the potential impact of oil contamination from increased tanker traffic in the Strait of Juan de Fuca. Initial studies were directed to intertidal sediments, mussels and snails from two physically similar areas: Port Angeles, WA and Dungeness Bay, WA. Latest analytical techniques of solvent/slurry extraction, silica gel chromatography, and glass capillary gas chromatography were adapted for analyzing large numbers of samples. The methods apply to alkanes in the C14 -C32 range, or to aromatics from substituted benzenes through benzpyrenes. Individual hydrocarbons were determined within 20% standard error at the 10 ng/g level. Lowest hydrocarbon levels were found at Dungeness Bay, a relatively pristine area. The profile of the alkanes suggests that the Dungeness hydrocarbons arise biogenically. Hydrocarbon levels were substantially greater at Port Angeles Harbor, especially adjacent to Peabody Creek. The even distribution of C14 - C22 n-al-

kanes from creekside sediment is consistent with known fuel oil seepage upstream. Above C22, the n-alkane pattern appears more biogenic, although the levels are high. Significant divergences between the two areas were found in the phenanthrene fluroanthene, and pyrene levels. Seventeen aromatic hydrocarbons are proposed for baseline monitoring. (Sinha-OEIS)
W78-08887

MERCURY IN SOUTHERN CALIFORNIA WATERS: INPUTS, DISTRIBUTION, AND FATE,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse, J. N. Johnson, D. R. Young, and D. J. McDermott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 465, Price codes: A04 in paper copy, A01 in microfiche. Report No TM 227, March 1976. 63 p, 19 fig, 14 tab, 47 ref.

Descriptors: *Mercury, *Water pollution sources, *California, Industrial wastes, Municipal wastes, Sediments, *Outer Continental Shelf, Ocean dumping, Outfall sewers, *Southern California Bight.

The identified sources of mercury to the Southern California Bight include municipal wastewaters, discrete industrial wastes, vessel-related activities, surface runoff, aerial fallout, ocean dumping, and ocean current advection. Ocean currents transport the greatest quantities of mercury through the Bight; however, municipal wastewaters are responsible for the localized buildup of high sediment concentrations of mercury in the vicinity of submarine outfalls. The 'background' level of mercury in sediments, approximately 0.05 mg/dry kg, is found in most regions of the Bight. However, levels up to 100 times greater have been reported for surface sediments near the outfalls of Los Angeles City (Hyperion) and Los Angeles County (Joint Water Pollution Control Plant, JWPCP). Recent model studies indicate that the dominant form of mercury in sewage is the insoluble sulfide. Upon mixing with seawater, the sewage particulates may release some of the associated mercury to the surrounding waters. Mercury that is not released or otherwise solubilized may become incorporated into sediments, where further biogeochemical transformations may occur. (Sinha-OEIS)
W78-08888

MARINE INPUTS OF POLYCHLORINATED BIPHENYLS AND COPPER FROM VESSEL ANTIFOULING PAINTS,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, T. C. Heesen, D. J. McDermott, and P. E. Smokler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 412, Price codes: A02 in paper copy, A01 in microfiche. Report No TM 212, May 1974. 23 p, 1 fig, 12 tab, 3 ref.

Descriptors: *Water pollution sources, *Polychlorinated biphenyls, *Copper, Antifouling materials, *California, Paints, *Outer Continental Shelf.

During 1973 an estimated 37,000 recreational vessels (5-21 m long) were docked within 14 major marinas in Southern California. Detailed surveys of major brands and quantities of antifouling paint applied to such craft and to commercial and naval vessels in Los Angeles/Long Beach and San Diego harbors were conducted. These studies revealed that approximately 300,000 liters of antifouling paint are applied annually to vessels in southern California. Only 7 of the 28 paints most commonly used yielded detectable CPB levels. Median concentrations of mixtures resembling Aroclor 1242 and 1254 were less than 0.3 and 0.1 mg/l, respectiveiy, and the maximum PCB concentration measured was 40/mg/l. However, the median copper concentration in these paints was estimated to be 600 g/l, corresponding to an annual copper application rate of about 180 metric tons. This copper, which is designed to be available and toxic to marine organisms, may have a larger environmental impact than the 600 metric tons of copper discharged annually via municipal wastewaters. (Sinha-OEIS)
W78-08889

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 1 AND 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08894

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08895

DETERMINATION OF PHOSPHATE FLUXES ACROSS THE SEDIMENT-WATER SURFACE OF THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
J. W. Morse, and J. de Kanel.
Technical Memorandum ERL MESA-14, April 1977. 10 p, 2 tab.

Descriptors: *Pollutant identification, *Sediment-water interfaces, *Water pollution sources, *Phosphates, New York, Bioturbation, *Outer Continental Shelf, *New York Bight, Interstitial waters.

Only a small portion of the total dissolved phosphate can be accounted for as distinct species in the interstitial waters of the site which was investigated. Visual inspection of the cores indicated that there was intense infaunal activity. Worms and living crabs were observed in the cores. It is suggested that bioturbation not diffusion is the dominant transport mechanism at the sediment-water interface. Data are not available on bioturbation rates which are probably variable both laterally and seasonally. Consequently, a flux rate cannot be calculated. Significant fluxes are possible. If 2 ml/sq cm of interstitial water are exchanged per day, the total phosphate added to a stagnant column of overlying water 15 meters deep would be enough to raise the concentration by approximately 0.6 micromoles/liter. (Sinha-OEIS)
W78-08897

BIODEGRADATION OF OIL IN SEAWATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, CA.
For primary bibliographic entry see Field 5G.
W78-08898

FIELD INFRARED METHOD TO DISCRIMINATE NATURAL SEEPS FROM NON-SEEPS (SANTA BARBARA, CALIFORNIA AREA),
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-08900

METHOD OF IDENTIFYING SOURCE OF PETROLEUM FOUND IN THE MARINE ENVIRONMENT. REPORT II,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-08901

CONTINUING DEVELOPMENT OF THE VULNERABILITY MODEL,
Enviro Control, Inc., Rockville, MD.
A. H. Rausch, N. A. Eisenberg, and C. J. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 197, Price codes: A15 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Final Report No. CG-D-53-77, February 1977. 341 p, 9 fig, 9 tab, 3 append. DOT-CG-33-377-A.

Descriptors: *Hazards, *Water pollution effects, Measurement, Chemical wastes, Toxicity, Oil pollution, *Simulation analysis, Model studies, *Computer studies, *Outer Continental Shelf, *Computer simulations.

The continuing development of the Vulnerability Model (VM), a computer simulation which provides a quantitative measure of the consequences of a marine hazardous chemical spill is described. Included are improvements in the modeling of fires, injury to indoor populations, additional toxicological analysis and modeling of ingestion of contaminated water. (Sinha-OEIS)
W78-08904

A FLUME FOR THE STUDY OF CONTAINED OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge.
J. Milgram, and R. Van Houten.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 160, Price codes: A03 in paper copy, A01 in microfiche. Sea Grant Program Report No. MITSG-77-19, Index No. 77-319-Nom, July 1977. 45 p, 17 fig, 1 tab, 8 ref.

Descriptors: *Oil pollution, *Flumes, *Water pollution sources, Flow, Pollutant identification, Equipment, *Outer Continental Shelf, Oil slicks.

A basic design that is a 'hybrid' of the sump type of flume and the 'wind tunnel circuit' type of flume is described and the overall geometry is shown. The fluid from the test section spills into a sump tank through a combination weir having fluid passing over it and under it. The remainder of the circuit is of the 'wind tunnel type'. From the sump tank, the flow passes through a contracting and then diverging nozzle section. From the nozzle section, the flow passes through a diffuser in which the flow area is expanded. The flow is then turned through ninety degrees from a horizontal direction to a vertical direction by means of a cascade of turning vanes. Then a second cascade of turning vanes turns the flow direction back to horizontal so that a flowing fluid is above the bottom branch of the circuit. A stilling section containing screens and a 'honeycomb' made from sections of tubing follows the upper vanes. A contraction of the natural drawn type follows the stilling section. The test section extends from the contraction outlet to the combination weir which controls the subcritical flow both over and under the weir. (Sinha-OEIS)
W78-08905

ORGANIC PHOSPHATE TRANSPORT AND HYDROLYSIS IN SOIL: THEORETICAL AND EXPERIMENTAL EVALUATION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
C. L. Castro, and D. E. Rolston.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1085-1091, November-December, 1977. 7 fig, 1 tab, 28 ref.

Descriptors: *Phosphates, Soils, Soil chemistry, Fertilizers, Irrigation, Irrigation water, *Hydrolysis, Kinetics, Soil water movement, *Path of pollutants, *Organic compounds.

An understanding of the movement, hydrolysis, and retention of organic phosphates in soils is necessary to evaluate possible advantages of the compounds as fertilizers, based upon their characteristic of increased vertical movement over that of inorganic phosphates when applied with irrigation water. Pulses of chloride and glycerophosphate were applied to 4-, 10-, and 20-cm long Panoche clay loam soil columns maintained slightly water-unsaturated. The concentration of glycerophosphate in th pulse applications varied from 386 to 1,110 ppm P. An analytical solution assuming first-order kinetics and a reversible, linear isotherm for gylcerophosphate hydrolysis and sorption, respectively, was compared with measured glycerophosphate concentrations in the column effluent. An analytical solution of the coupled equations for simultaneous transport of organic phosphate and orthophosphate assuming a linear, reversible isotherm for orthophosphate adsorption is given. (Skogerboe-Colorado State)
W78-08911

SEASONAL ANHYDROUS AMMONIA COMPARISON FOR CORN WITH AND WITHOUT A NITRIFICATION INHIBITOR,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W78-08927

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08932

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
For primary bibliographic entry see Field 5A.
W78-08934

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS--OR DID THE REAL SPILLER GET AWAY,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5A.
W78-08941

INFRARED SPECTRA OF PETROLEUM - DATA BASE INFORMATION AND APPLICATION TO REAL SPILLS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-08943

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES VII. SELENIUM LEVEL IN MUSCLES OF YELLOWFIN TUNA AND IN LIVERS AND SPLEENS OF TUNA AND MARLIN (IN JAPANESE),
Shimonoseki University of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W78-08959

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - II. DISTRIBUTION OF HYDROCARBON-OXIDIZING BACTERIA IN THE OIL-POLLUTED AREAS CAUSED BY THE MIZUSHIMA OIL REFINERY ACCIDENT (IN JAPANESE),
Simonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W78-08964

WATER QUALITY OF THE OHIO RIVER, LOUISVILLE, KENTUCKY-EVANSVILLE, INDIANA.
National Field Investigations Center-Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 157, Price codes: A07 in paper copy, A01 in microfiche. September, 1970. 143 p.

Descriptors: *Water quality, *Ohio River, *Kentucky, *Indiana, *Ohio, Rivers, Water pollution, Federal government, United States, Administration, Administrative agencies, Surveys, Fish, Aquatic microbiology, Bacteria, Coliforms, Dissolved oxygen, Sewage, Aquatic environment, River systems.

A water quality survey of the Ohio River between Louisville, Kentucky and Evansville, Indiana was made in 1967. Its purpose was to determine bacteriological quality, specifically the causes of high coliform densities and probable causes of fish flesh tainting. Eight general subjects were considered: As part of the survey, average river discharges were estimated and water temperatures of the river were calculated. Dissolved oxygen concentrations in the river were found to be higher than the Indiana and Kentucky water quality standards for aquatic life now specify, and bacterial pollution from inadequately treated sewage was found to create a health hazard in the survey area. In addition, plankton, the river's food web base, was discovered to be detrimental because it imparted tastes and odors to domestic water supplies; sludge from organic pollution was shown to be detrimental to fish; fish captured downstream proved to be unpalatable; and many catfish were of unacceptable quality. Since the preparation of this report, state standards have been upgraded to its water quality standards. (Quarles-Florida)
W78-08989

DYNAMICS OF RESERVOIR OF MEDIUM SIZE,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W78-09031

DILUTION IN A VERTICAL ROUND BUOYANT JET,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 8B.
W78-09033

CONTAMINANT TRANSPORT TO DEEP WELLS,
Weston (Roy F.), Inc., Roslyn, NY.
For primary bibliographic entry see Field 5G.
W78-09034

TRANSIENT MIXING IN RIVER CHANNELS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
H. T. Shen.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE3, Proceeding Paper 13810, p 445-459, June 1978. 7 fig, 28 ref, 2 append.

Descriptors: *River flow, *Mixing, *Model studies, *Dispersion, Mathematical studies, Mathematical models, Steady flow, Ice cover, Channel flow, Open channel flow, Hydraulics, Convection, Water quality, Water pollution, Pollutants, Distribution patterns, Analytical techniques, Analysis, Natural streams, Transient mixing, Two dimensional flow.

A mathematical model was developed for two-dimensional transient mixing in natural river channels based on an existing steady-state formulation. Nonuniformities of the flow and river geometry were treated by an orthogonal curvilinear coordinate system and the use of a cumulative discharge. Relationships between the unit width discharge and depth were presented, for both the ice-covered case and the open water case, to enable the construction of synthetic transverse flow distributions when there is no field measurement available. Under restrictive assumptions, the governing equation can be reduced to the conventional Fickian equation that can be solved analytically. Analytical solutions for the dispersion of nonconservative substances from line sources of variable strength were derived. In general, these analytical solutions are in integral or series forms that can be evaluated efficiently by existing numerical techniques. Examples were presented to show the pattern of concentration distributions and effects of various parameters. (Humphreys-ISWS)
W78-09042

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
For primary bibliographic entry see Field 6G.
W78-09070

TRACING THE TRANSFORMATIONS OF UREA FERTILIZER DURING LEACHING,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
For primary bibliographic entry see Field 2G.
W78-09114

UPTAKE AND LOSSES OF 15N APPLIED TO ANNUAL GRASS AND CLOVER IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
M. B. Jones, C. C. Delwiche, and W. A. Williams.
Agronomy Journal, Vol. 69, No. 6, p 1019-1023, November-December 1977. 2 fig, 3 tab, 10 ref.

Descriptors: *Nitrogen-15, Lysimeters, Fertilizers, Fertilization, Nutrients, California, *Leaching, Denitrification, Nitrate-nitrogen, Ammonia-nitrogen, *Grasses, *Clovers, *Absorption.

The California annual grasslands comprise about one-third of the state, and they play a large role in the hydrology of most watersheds in central and northern California. Apparent recovery of applied N has been low, and a large percentage has been unaccounted for in N balance studies. An experiment was done with 15N to determine the fate of applied N, especially that leached and that volatilized (by difference). Conclusions: There was modest leaching loss but essentially no gaseous loss from moderate rates of N applied to grass in October; there was almost negligible leaching loss but modest gaseous loss from moderate rates of N applied to grass in February; recovery of fertilizer by clover was poor; and a single large application (500 kg N/ha) resulted in a substantial leaching and gaseous losses under both grass and clover. (Skogerboe-Colorado State)
W78-09120

DEICING SALT MOVEMENT AND ITS EFFECTS ON SOIL PARAMETERS AND VEGETATION,
Maryland Univ., College Park. Dept. of Agronomy.
C. A. Buzio, G. W. Burt, and J. E. Foss.

Agronomy Journal, Vol. 69, No. 6, p 1030-1032, November-December 1977. 3 fig, 1 tab, 13 ref.

Descriptors: *Salts, Soils, Soil investigations, *Soil properties, Chlorides, Salinity, Saline soils, Toxicity, *Deicing, Salt tolerance, Vegetation.

Salt damage to the environment occurs in restricted areas in humid regions as a result of factors such as industrial waste, sea water, and deicing salt. A study was conducted, therefore, to determine the distribution of salt leached from a deicing salt pile, and its effects on soil parameters (pH, Mg, P, and K) and plant successional changes in a hardwood forest area. Lateral movement and leaching of chloride was studied as it occurred in an adjacent slope by sampling the soil to a depth of 76 cm at 17 sites. The soil samples collected from the field were then analyzed for salt content by using the conductivity bridge. Lateral movement (of chloride) was extensive with subsequent leaching to a depth greater than 76 cm. Of the measured soil parameters, only K was correlated with NaCl concentration. Within 3 years of the establishment of the salt stockpile, all the trees in the sampled area were dead. Out of 29 plant species found to have invaded the sites with less than 5,000 ppm of NaCl, only 10 were found in sites with concentrations greater than 15,000 ppm. Recommendations to be considered when establishing a deicing salt pile are presented. (Skogerboe-Colorado State)
W78-09122

TILLAGE SYSTEM EFFECTS ON RUNOFF WATER QUALITY: PESTICIDES,
Iowa State Div., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-09145

TILLAGE SYSTEM EFFECTS ON RUNOFF WATER QUALITY: SEDIMENTS AND NUTRIENTS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
H. P. Johnson, J. L. Baker, W. D. Shrader, and J. M. Laflen.
Paper No. 77-2504 presented at the 1977 Winter Meeting, American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 15 p, 2 fig, 3 tab, 9 ref.

Descriptors: Corn, Nitrogen, Erosion, Soil erosion, Phosphorus, Soil conservation, Water quality, Sediments, Nutrients.

Three tillage systems were utilized for growing corn on six paired small watersheds. The tillage systems retained a range of residue cover on the soil varying from about three to forty-five percent. Most of the nitrogen losses were associated with erosion. Soluble phosphorus losses were greatest with conservation tillage. Surface residue reduced markedly the soil losses. (See also W78-09145) (Skogerboe-Colorado State)
W78-09146

IRRIGATION RETURN FLOW MODELING--A STATE OF THE ART,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-09147

SIMULATION OF NUTRIENT LOSSES FROM CROPLAND,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
L. J. Tubbs, and D. A. Haith.
Paper No. 77-2502 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 34 p, 17 fig, 14 tab, 34 ref.

Descriptors: *Model studies, Nitrogen, Phosphorus, Runoff, *Nutrients, Infiltration, *Simulation analysis, *Agricultural runoff.

A mathematical model has been developed to predict losses of nitrogen and phosphorus in cropland runoff and percolation water. The model is based on daily hydrologic and monthly soil nutrient balances. The model does not require calibration and has been validated using data from monitored field plots. Reasonable predictions of annual losses are obtained for dissolved inorganic nitrogen in runoff and percolation and dissolved inorganic phosphorus in runoff. Seasonal variations are well-predicted for nitrogen but not for phosphorus. (Skogerboe-Colorado State)
W78-09148

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
E. I. Lehmann.
Available from the National Technical Information Service, Springfield, VA 22161 as NTIS/PS-78/0141, Price codes: N01 in paper copy, N01 in microfiche. Bibliography NTIS/PS-77-0008, February 1977, 240 p.

Descriptors: *Bibliographies, *Abstracts, *Groundwater, Pollutants, *Fertilization, *Irrigation effects, Waste water(Pollution), Solid wastes, Nitrates, Phosphates, Abatement, Water pollution, Irrigation water conservation.

This bibliography contains abstracts and citations from the NTIS data base of Federally-funded research covering all aspects of groundwater pollution from irrigation and fertilization. Topics deal with the pollution from sewage and waste water irrigation, land spreading of sludges and solid wastes, nitrate and phosphate accumulation in soils, pollution control and abatement planning, salt build-up from irrigation, the use of tile drains in groundwater pollution control, and groundwater recharge studies. (This updated bibliography contains 240 abstracts, 18 of which are new entries to the previous edition.) (Skogerboe-Colorado State)
W78-09151

DISTRIBUTION AND BIOTIC EFFECTS OF NUTRIENTS IN FLATHEAD LAKE, MONTANA,
Montana Univ., Flathead Lake. Biological Station.
For primary bibliographic entry see Field 5C.
W78-09155

OBSERVATIONS OF ALGAL ZONATION RESULTING FROM COMPETITION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-09159

PHYTOPLANKTON GROWTH AND CHLOROPHYLL LEVELS IN THE SACRAMENTO - SAN JOAQUIN DELTA THROUGH SAN PABLO BAY,
Bureau of Reclamation, Sacramento, CA. Mid-Pacific Region.
For primary bibliographic entry see Field 5C.
W78-09163

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-09164

DETERMINATION OF THE RATE AND EFFICIENCY OF NITROGEN TRANSFER FROM PHYTOPLANKTON TO ZOOPLANKTON USING NITROGEN-15 AS A TRACER,
Columbia Univ., New York. Teachers Coll.
For primary bibliographic entry see Field 5C.
W78-09167

PREDICTIONS OF HEAT AND MASS TRANSFER IN OPEN CHANNELS,
Karlsruhe Univ. (West Germany).
A. K. Rastogi, and W. Rodi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13639, p 397-420, March 1978. 6 fig, 24 ref, 2 append.

Descriptors: *Mass transfer, *Heat transfer, *Open channels, *Model studies, Mathematical models, Effluents, Water pollution, Flow, Channel flow, Rivers, Temperature, Water temperature, Turbulence, Dispersion, Cooling water, Channels, Buoyancy, Fluid flow, Froude number, Hydraulics.

The paper described a three-dimensional model for calculating the distribution of velocity, temperature, and pollutant concentration in open channel flows, and a depth-averaged two-dimensional version for situations with insignificant stratification and secondary currents. Both models were restricted to parabolic flows, where influences cannot be transmitted upstream. The turbulent stresses and heat concentration fluxes appearing in these equations were determined from the so-called k-epsilon turbulence model that solves differential transport equations for the turbulence kinetic energy k and the rate of its dissipation epsilon. In the depth-averaged model, the bottom shear stress surface heat flux and turbulence production due to bottom shear stress are accounted for by source/sink terms in the relevant equations. The 3D calculations compared favorably with available measurements. The 2D and 3D predictions agreed well for high Froude numbers; for a Froude number of 5 they agreed only for the rough bed, while for the smooth bed they start to deviate significantly at a Froude number of 10. (Sims-ISWS)
W78-09203

A MODEL TO INVESTIGATE THE INFLUENCE OF SUSPENDED SEDIMENT ON THE MASS TRANSPORT OF A POLLUTANT IN OPEN CHANNEL FLOW,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
R. S. Chapman.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-20380, Price codes: A05 in paper copy, A01 in microfiche. Masters of Engineering Thesis, March 1977. 71 p, 25 fig, 1 tab, 33 ref.

Descriptors: *Sediment transport, *Suspended load, *Pollutants, *Open channel flow, Channels, Mass transfer, Metals, Pesticide drift, Herbicides, Mathematical models, Turbulence, Stratified flow, Sorption, Alluvial channels, Water quality, Model studies, Transport process, Finite difference model.

In this study, an explicit two-dimensional finite difference model, designed to investigate the influence of suspended sediment on the pollutant transport process, was presented. Specific attention was directed toward examining the role of suspended sediment in (1) the turbulent vertical transport mechanism in a stratified flow, and (2) pollutant uptake due to sorption. Results presented indicated that suspended sediment plays a major role in the pollutant transport process, and subsequently, any meaningful attempt to model the fate of a pollutant in an alluvial channel must account for the presence of a suspended sediment concentration profile. Similarly, the vertical and

longitudinal pollutant concentration distributions provided by the model may be utilized to improve upon the predictive capacities of existing water quality models. (Bhowmik-ISWS)
W78-09219

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
E. J. Leaky, W. B. Lane, T. M. Tami, L. B. Inman, and W. R. McLoud.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 133, Price codes: A06 in paper copy, A01 in microfiche. Technical Report N-76-1-App-A, May 1976. 124 p.

Descriptors: *On-site data collections, *Sediments, *Dredging, *California, Bays, Sampling, Data collections, Spoil banks, Estuaries, *San Francisco Bay, *Dredged material.

This appendix is a tabulation of the San Francisco Bay Sampling Data. The tabulations included locations of sampling holes and sampling depths, locations of hopper samples, sampling dates, and analytical results for each sample. (See also W78-03257) (Humphreys-ISWS)
W78-09225

IDENTIFICATION AND SPECIFICATION OF INPUTS FOR BENEFIT-COST MODELING OF PESTICIDE USE,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6A.
W78-09238

WATER QUALITY LOADINGS DURING THIRTEEN STORMS ON THE CADDO RIVER, ARKANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
E. R. Perrier, H. E. Westerdahl, and J. F. Nix.
Paper No. 7702529 American Society of Agricultural Engineers, Saint Joseph, Michigan (1977) 28 p, 5 fig, 11 tab, 14 ref.

Descriptors: *Water quality, Sediments, Sedimentation, *Sediment loads, Sedimentary basins, *Arkansas, *Caddo River(Ark), Water pollution sources, *Storms, *Nonpoint pollution sources.

Nonpoint source loadings of twenty-five selected water quality parameters have been described for thirteen storm events on the Caddo River drainage basin in Arkansas. These parameters were functionally related to onsite measurements although wide variation was attributable to hysteresis and the stochastic nature of the system. (Skogerboe-Colorado State)
W78-09255

OBSERVATION OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-09276

RECRUITMENT OF BENTHIC ANIMALS AS A FUNCTION OF PETROLEUM HYDROCARBON CONCENTRATIONS IN THE SEDIMENT,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-09278

BENTHIC HYDROCARBONS OF RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Estuarine and Coastal Marine Science, Vol. 6, p 471-494, 1978. 7 fig, 6 tab, 34 ref.

Descriptors: Sediments, *Bottom sediments, *Bottom sampling, *Clams, *Shellfish, Cores, *Core drilling, Animal metabolism, *Oil pollution, *Geochemistry, *Oil, *Dredging, *Sedimentation, *Polychlorinated biphenyls, Organic compounds, Path of pollutants, Rhode Island, Quahog, Arctica, Tissue analysis, Bioaccumulation, *Rhode Island Sound(RI).

The hydrocarbon contents of surface sediments, sediment cores and ocean quahogs from Rhode Island Sound have been determined. Hydrocarbon concentrations in surface sediments normally range from 1.0 to 56.1 micrograms/g, largely dependent on sediment type and sedimentation rates. However, concentrations up to 301 micrograms/g are observed in surface samples from a dredge spoil deposit located in the study area. Hydrocarbon contents of the ocean quahog do not reflect the sediment distributions qualitatively or quantitatively. Throughout the study area the clams' hydrocarbon contents vary by a factor of 2.5 (2.6-6.4 micrograms/g wet) while the sediment concentrations vary by two orders of magnitude. A sediment core from the area shows a decreasing concentration of hydrocarbons and a decreasing percentage of unresolved components (UCM) with increasing depth. It is proposed that the rapid increase in the quantity of the UCM observed at a certain depth within the sediment, can serve as a chemical marker in the recent sedimentary record. This marker corresponds to the increased usage of petroleum products at the end of the 19th century. (EIS-Deal)
W78-09279

PERSISTENCE OF POLYCHLORINATED BIPHENYLS IN MARINE BIVALVES,
London Univ. (England). Dept. of Zoology.
W. J. Langston.
Marine Biology, Vol. 46, p 35-40, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Bivalves, *Aroclors, *Halogenated pesticides, *Chlorinated hydrocarbon pesticides, *Chlorination, *Chlorine, Chemical reactions, Animal physiology, Animal metabolism, *Polychlorinated biphenyls, *Pesticide residues, Bioindicators, Water temperature, Suspended solids, Path of pollutants, Metabolism, Organic compounds, Isomers, Macoma, Cerastoderma, Bioaccumulation, Tissue analysis.

Bivalves which had previously been exposed to Aroclors 1242, 1254, and 1260 were able to reduce their tissue burdens of chlorobiphenyls with 2 to 5 chlorine atoms in short-term static assay systems. Elimination rates decreased with increasing chlorination and removal of isomers with more than 5 chlorine atoms was not recorded. Position, in addition to the number, of chlorine atoms influenced the persistence of chlorobiphenyls. Isomers with most 'ortho'-substituted chlroine atoms were least persistent. Experiments with single isomers indicated variation in the elimination of low chlorinated isomers between bivalve species. These biological and chemical influences on tissue residues, together with environmental parameters such as temperature and suspended solids, are considered in relation to the use of bivalves as bio-indicators of marine pollution. (EIS-Deal)
W78-09280

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLOFJORD,
For primary bibliographic entry see Field 5C.
W78-09281

DINOFLAGELLATE TOXINS AS PROBABLE CAUSE OF AN ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) KILL, AND PTEROPODS AS APPARENT VECTOR,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
A. W. White.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 2421-2424, 1977. 1 tab, 12 ref.

Descriptors: *Fishkills, *Toxins, *Dinoflagellates, *Food chains, *Herrings, *Path of pollutants, *Algal toxins, *Vectors(Biological), Commercial fish, Aquatic microorganisms, Microbiology, Mortality, Eutrophication, Clupea harengus, Limacina, Pteropods, Gonyaulax, *Bay of Fundy.

Stomachs of Atlantic herring (Clupea harengus harengus) from a kill that occurred in the Bay of Fundy during a bloom of the toxic dinoflagellate Gonyaulax excavata contained pteropods, algal remains, and paralytic toxins. Experiments show that comparable amounts of G. excavata toxins can kill herring rapidly. It is likely that the kill was caused by paralytic dinoflagellate toxins, and that the pteropod Limacina retroversa, a planktonic herbivore, acted as a vector of the toxins. (EIS-Katz)
W78-09288

POPULATION DYNAMICS OF DAPHNIA GALEATA MENDOTAE AS MODIFIED BY CHRONIC CADMIUM STRESS,
For primary bibliographic entry see Field 5C.
W78-09289

COMPARATIVE METABOLISM OF PCB ISOMERS BY THREE SPECIES OF FISH AND THE RAT,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W78-09295

5C. Effects Of Pollution

TROPHIC CONDITIONS IN LAKE WINNISQUAM, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.
L. R. Frost, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 022, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-137, 1977. 36 p, 12 fig, 12 tab, 11 ref. NH 76-020C.

Descriptors: *Trophic level, *Lakes, *Sewage effluents, *Sewage treatment, *Water quality, Phytoplankton, Nutrients, Water analysis, Limnology, Thermal stratification, Epilimnion, Hypolimnion, Dissolved oxygen, New Hampshire, *Lake Winnisquam, Chemical analysis.

Lake Winnisquam has received treated domestic sewage for approximately 50 years and since June 1961 has been treated with copper sulfate to control the growth of nuisance algae. The Laconia City secondary sewage-treatment plant was upgraded in 1975 to include phosphorus removal. Phosphorus was not removed effectively until early 1976, and, therefore, the 1976 data are considered baseline or pre-phosphorus removal with respect to anticipated changes in the trophic condition of the lake. Effluent from the Laconia State School primary-treatment plant was diverted to the Laconia City plant in October 1976. Dissolved oxygen concentrations showed marked differences between the two basins comprising Lake Winnisquam. Phytoplankton samples showed similarities by algal group for all stations but algal genera varied between the upper and lower basins. Total phosphorus concentrations in the epilimnion ranged from 0.01 to 0.10 milligram per liter, and ac-

cumulation of total phosphorus in the hypolimnion resulted in concentrations up to 0.59 milligrams per liter. Chemical states of nutrients varied among the stations corresponding to the degree of depletion of hypolimnetic dissolved oxygen. Dissolved oxygen profiles were used to illustrate zones of algal production, respiration, and bacterial decomposition. The rate of depletion of dissolved oxygen in the hypolimnion was linearly related to time. Because change in the rate of hypolimnetic dissolved oxygen depletion is more easily measured than change of nutrient load in the lake, it is suggested it be used as an indicator of the response of the lake to change in trophic condition. (Woodard-USGS)
W78-08842

CHANGES IN THE PREDATOR-PREY BEHAVIOR OF FATHEAD MINNOWS (PIMEPHALES PROMELAS) AND LARGEMOUTH BASS (MICROPTERUS SALMOIDES) CAUSED BY CADMIUM,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
J. F. Sullivan, G. J. Atchison, D. J. Kolar, and A. W. McIntosh.
Journal of the Fisheries Research Board of Canada, Vol 35, p 446-451, 1978. 1 fig, 4 tab, 20 ref.

Descriptors: *Toxicity, *Predation, *Fish behavior, *Cadmium, *Bass, *Minnows, *Fish physiology, *Food habits, *Bioassay, Path of pollutants, Water pollution effects, Metals, *Sublethal effects.

Increased prey vulnerability was demonstrated for fathead minnows undergoing acute (24-h) and subacute (21-d) sublethal cadmium exposure prior to interacting with largemouth bass. The lowest acute and subacute cadmium concentrations that increased prey vulnerability were 0.375 and 0.025 mg Cd/L, respectively, with the latter well below the maximum acceptable toxicant concentration for fathead minnows. Prey exposed to cadmium displayed altered behavoir patterns, including abnormal schooling behavior. (EIS-Deal)
W78-08861

THE DISTRIBUTION OF METHYL MERCURY IN CONTAMINATED SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-08863

EFFICACY OF COPPER SULPHATE IN THE SUPPRESSION OF APHANIZOMENON FLOS-AQUAE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5G.
W78-08864

UPTAKE OF POLYCHLORINATED BIPHENYL (AROCLOR 1254) FROM SEDIMENT AND FROM SEAWATER IN TWO INTERTIDAL POLYCHAETES,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-08865

IRON IN MAINE COASTAL WATERS; SEASONAL VARIATION AND ITS APPARENT CORRELATION WITH A DINOFLAGELLATE BLOOM,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
For primary bibliographic entry see Field 5B.
W78-08866

TOXICITY OF A MIXTURE OF METALS ON FRESHWATER ALGAE,
Canada Centre for Inland Waters, Burlington (Ontario).
P. T. S. Wong, Y. K. Chau, and P. L. Luxon.
Journal of the Fisheries Research Board of Canada, Vol 35, p 479-481, 1978. 1 tab, 10 ref.

Descriptors: *Arsenic compounds, *Cadmium, *Chromium, *Copper, *Iron, *Lead, *Mercury, *Nickel, *Selenium, *Zinc, *Toxicity, Heavy metals, Metals, *Great Lakes, *Water quality standards, *Diatoms, *Primary productivity, *Chlorophyta, *Cyanophyta, *Food chains, Water pollution effects, Growth rates, Biological communities, Ecosystems, Lethal limit.

Recommended levels of a number of metals for Great Lakes Water Quality Objectives were found to be very toxic to freshwater algae when these metals were present simultaneously in lake water and culture medium. The diatom tested was more sensitive to metal toxicity than the blue-green and green algae. The metals tested were arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. (EIS-Deal)
W78-08868

MARINE ENVIRONMENTAL IMPACT DUE TO MINING ACTIVITIES OF EL SALVADOR COPPER MINE, CHILE,
Universidad Catolica de Chile, Santiago. Lab. de Zoologia.
For primary bibliographic entry see Field 5B.
W78-08869

THE IMPLICATIONS OF COMMUNITY STRUCTURE FOR BENTHIC MONITORING STUDIES,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5A.
W78-08870

UPTAKE OF RADIOACTIVITY BY MARINE SEDIMENTS AND IMPLICATIONS FOR MONITORING METAL POLLUTANTS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W78-08871

MUSSEL MORTALITY IN THE GULF OF LA SPEZIA, ITALY,
Atkins Research and Development, Epson (England).
R. I. Collinson, and C. P. Rees.
Marine Pollution Bulletin, Vol. 9, p 99-101, 1978. 1 fig, 9 ref.

Descriptors: *Mussels, *Mortality, *Dissolved oxygen, *Dredging, Animal physiology, Sampling, Metabolism, Shellfish, Mollusks, Invertebrates, Biochemical oxygen demand, Copper, Benthic fauna, Aquatic life, Mud, Water quality, Aquatic life, Environmental effects, Italy, La Spezia(Italy), Mud particles.

High mortality of mussels on culture-ropes observed during dredging operations in the Gulf of La Spezia, Italy, was due primarily to reduced levels of dissolved oxygen. Mud particles blocking the mantle cavity produced suffocation, and their presence on the valves and in the vicinity of the mussels produced a high biochemical oxygen demand which markedly reduced the oxygen concentration in the water. The effect of soluble and insoluble phases of copper released from the perturbed mud and re-suspended in the water column was difficult to ascertain, but under certain conditions it might have introduced additional mechanical and physiological stress. (EIS-Klein)
W78-08872

MOLECULAR STRUCTURE - BIOLOGICAL PROPERTIES RELATIONSHIPS IN ANIONIC SURFACE-ACTIVE AGENTS,
Institut National de Recherche Chimioue Appliouee, Vert-le-Petit (France).
P. Lundahl, and R. Cabridenc.
Water Research, Vol. 12, p 25-30, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Toxicity, *Organic compounds, Chemistry, *Molecular structure, Chemical properties, Water structure, Anions, Aquatic life, Biochemistry, Sulfonates, Organophosphorus compounds, Analytical techniques, Surfaces, Water quality, Mathematics, Daphnia, Chlamydomonas, Microorganisms, Surfactants, Freshwater fish, *Surface-active agents, Phoxinus.

Molecular structure-toxicity relationships in anionic surface-active agents were studid, using aquatic organisms for the bioassays. In a series of homologs the toxicity increased sharply when the hydrophobic chain length increased. A simple logarithmic equation described the relationship. This equation can be used to predict the toxicities. A simplified thermodynamic interpretation was proposed. Variations of the biodegradability with the chain length were tentatively explained. The organisms studied were Chlamydomonas, Phoxinus, and Daphnia, the latter being the most sensitive to anionic surface-active agents. (EIS-Klein)
W78-08873

FISH COUGH RESPONSE - A METHOD FOR EVALUATING QUALITY OF TREATED COMPLEX EFFLUENTS,
Environmental Research Lab.-Duluth, MN.
R. W. Carlson, and R. A. Drummond.
Water Research, Vol. 12, p 1-6, 1978. 2 fig, 2 tab, 22 ref.

Descriptors: *Fish physiology, *Industrial wastes, *Sunfishes, *Effluents, Fish behavior, Sewage effluents, Environmental effects, Path of pollutants, Water quality, Lethal limit, Toxicity, Mortality, Evaluation, Water pollution effects, Bioindicators, *Bluegill sunfishes, *Fish Cough Response, Lepomis macrochirus, Sublethal response.

Bluegill sunfish (Lepomis macrochirus) showed increases in cough frequency commensurate with effluent concentration when exposed for 24 h to different industrial and municipal effluents. Effluents known to be toxic caused steadily increasing cough rates in the fish as effluent concentrations approached acutely toxic levels. Bluegills exposed to three different samples of effluent, collected from the same source over an 8-month period, showed decreased levels of cough rate as the effluent improved in quality. Cough frequency was found to be rapid and sensitive physiological characteristic for evaluating the quality of industrial and municipal effluents and variation in quality of same-source effluents before discharge into receiving waters. (EIS-Klein)
W78-08874

MECHANICAL CUTTING OF SUBMERSED MACROPHYTES: IMMEDIATE EFFECTS ON LITTORAL WATER CHEMISTRY AND METABOLISM,
Wisconsin Univ.-Madison. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-08875

A COMPARISON OF THE EFFECTS OF CHLORDANE AND PCB ON THE GROWTH, PHOTOSYNTHESIS, AND CELL SIZE OF ESTUARINE PHYTOPLANKTON,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
D. C. Biggs.
Environmental Pollution, Vol. 15, p 253-263, 1978. 3 fig, 2 tab, 26 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Aroclors, *Polychlorinated biphenyls, *Phytoplankton, Biological communities, Organic compounds, Absorption, Growth rates, Chlorides, Environmental effects, Primary productivity, Chlorophyll, Photosynthesis, Diatoms, Water quality, Dimensions, *Chlordane, *Aroclor 1254, Cell size.

Daily additions of 10 micrograms chlordane or 5 or 10 micrograms Aroclor 1254 to 1 liter of dialysis culture of mixed species of estuarine phytoplankton, reduced algal growth rate and 14C-uptake per unit chlorophyll a. Inhibition of chlordane lasted 24-48 h, and the community cell-size distribution was not substantially altered. Aroclor caused longer-term effects, inhibiting the growth of phytoplankton larger than 8 micrometers in equivalent spherical diameter (i.e. large centric diatoms) more strongly than that of smaller forms (pennate diatoms and microflagellates), so that the community composition shifted in favor of small-size algae. Aroclor was found to be more inhibitory than chlordane in all the parameters tested. (EIS-Klein)
W78-08879

EFFECTS OF LABORATORY PROCEDURE ON FUEL OIL TOXICITY,
Massachusetts Univ., Gloucester. Marine Station.
A. D. Michael, and B. Brown.
Environmental Pollution, Vol. 15, p 277-287, 1978. 6 fig, 21 ref.

Descriptors: *Methodology, *Research and development, *Laboratory tests, *Testing procedures, Toxicity, Fuels, Amphipods, Sediment, Sand, Lethal limit, Water temperature, Testing, Analytical techniques, Water quality, *Laboratory procedure, *No. 2 Fuel Oil, Experimental conditions.

Laboratory testing of No. 2 fuel oil toxicity to the amphipod Neohaustorius schmitzi in artificial sea water demonstrated that each of several experimental factors produced significant variation in test results. Variables examined were: presence of substrate (sand), concentration of oil (0.05 or 0.025 ml/liter), stirring rate, age of the oil/water mixture, evaporation and temperature. (EIS-Katz)
W78-08880

MARINE ECOLOGY AND OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. M. Baker.
Journal of the Water Pollution Control Federation, Vol 50, p 442-449, 1978. 25 ref.

Descriptors: Environmental effects, *Oil pollution, *Aquatic life, Biological communities, Testing procedures, Ecology, Monitoring, Surveys, On-site data collections, Bioindicators, Ecosystems, Analysis, Water pollution effects.

An outline of approaches used by the Oil Pollution Research Unit to find the effects of oils and related pollutants on the marine environment was presented. Priority was given to field surveys, biological monitoring and field experiments. Results indicated that no generalization can be made about biological damage caused by oil pollution. A number of factors appeared to be important in determining the extent of damage including type and volume of discharge, type of oil, cleaning treatment, climate and topography, and characteristics of the biological communities involved. The objectives, methods, and difficulties of biological monitoring were discussed. (EIS-Klein)
W78-08881

RECOVERY OF INDICATOR BACTERIA IN ACID MINE STREAMS,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5A.
W78-08882

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 1.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08891

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 2.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08892

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 3.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08893

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
For primary bibliographic entry see Field 2L.
W78-08896

ECOLOGICAL EVALUATION OF PROPOSED DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS.
California Univ., Bodega Bay. Bodega Marine Lab.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 209, Price codes: A07 in paper copy, A01 in microfiche. Army Corps of Engineers and U.S. Environmental Protection Agency Joint Implementation Manual, July 1977. 126 p, 8 append. Peddicord, R.K. (Ed.).

Descriptors: *Water pollution effects, *Dredging, *Environmental effects, *Regulation, Ecology, Resources development, *Outer Continental Shelf, *Ocean dumping, Dredge material, Spoil disposal, Biological effects.

In accordance with Section 227.27(b) of the Federal Register, Vol 42, No 7, 11 Jan 1977, an implementation manual has been developed jointly by the Environmental Protection Agency and the Corps of Engineers. Procedures are presented for evaluating potential environmental impacts of the discharge of dredged material into ocean waters, an evaluation that is required in considering permit applications for transporting dredged material for ocean dumping. This manual represents a multidisciplinary effort of both agencies to develop procedurally sound, routinely implementable guidance for complying with the technical requirements of the Register. The procedures are applicable to evaluating the potential ecological effects of dumping from hopper dredges, barges, and scows. Detailed guidance is provided on sediment and water sample collection, preparation, and preservation; chemical analysis of the liquid phase; bioassays of liquid, suspended particulate, and solid phases; estimation of bioaccumulation potential; and estimating the initial mixing. (Sinha-OEIS)
W78-08899

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 1 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08928

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 2 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08929

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 3 OF 3,
Winzler and Kelly., Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08930

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08933

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES VII. SELENIUM LEVEL IN MUSCLES OF YELLOWFIN TUNA AND IN LIVERS AND SPLEENS OF TUNA AND MARLIN (IN JAPANESE),
Shimonoseki University of Fisheries (Japan).
M. Takeda, and T. Ueda.
The Journal of the Shimonoseki University of Fisheries, Vol. 26, No. 3, p 267-279, 1978. 14 ref, 13 fig, 2 tab.

Descriptors: *Heavy metals, *Mercury, Size, *Commercial fish, *Marine fish, *Weight, Metals, Public health, Pacific Ocean, Indian Ocean, Bioaccumulation, *Selenium, Tissue analysis, *Tuna, *Marlin, Yellowfin Tuna.

Selenium levels were determined in the muscle tissues of 39 yellowfin tuna and in the livers and spleens of 29 tuna of 3 species and 10 marlin of 4 species from the Pacific and East Indian Oceans. Selenium levels in muscle tissues of yellowfin tuna were independent of fish size or total mercury level. There is no significant correlation between selenium level in the dorsal muscle (mean 0.54 micro g/g) and that in the dark muscle (mean 5.24 micro g/g) for yellowfin tuna. Mean selenium levels in livers and spleens were 21.49 and 27.07 for tuna and 9.04 and 7.16 micro g/g for marlin, respectively. There was no significant difference (at 0.01 level) between the selenium level in livers and in spleens for both tuna and marlin. Selenium levels in livers and spleens of marlin were significantly correlated (at 0.1 level) with total mercury and body weight. Selenium levels of tuna were independent of total mercury, methylmercury, and weight. Whether the correlation of selenium level

to weight or to total mercury level is significant may depend on the relative magnitude of the increment in the level of selenium which is accumulated, with mercury even beyond the substantial basal level. The Se/Hg (molar basis) in the livers and spleens were significantly inversely correlated (at 0.01 level) with weight throughout tuna and marlin. (See also W78-04144(IV), W78-03942(III), and W78-03941(II)) (EIS-Katz)
W78-08959

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Institution, MA.
D. G. Grice, and D. W. Menzel.
Marine Science Communications, Vol 4, No 1, p 23-31, 1978. 10 ref.

Descriptors: *Mercury, Ecosystems, Biological communities, *Bacteria, *Phytoplankton, *Zooplankton, Fish populations, Water chemistry, *Metabolism, *Nitrates, *Toxicity, *Diatoms, Populations, *Eutrophication, *Copper, Path of pollutants, Water pollution effects, *Controlled experimental ecosystems.

This paper summarizes the results of seven previous papers of the Controlled Ecosystem Pollution Experiment group. The articles documented the reactions to mercury of plankton communities maintained in 1300 m3 plastic enclosures for a period of 72 days. A summary of the effects of bacteria, phytoplankton, zooplankton, fish and water and sediment chemistry is presented. (See also W78-05144) (EIS-Deal)
W78-08960

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VII. INHIBITION OF NITROGEN ASSIMILATION AND AMMONIA REGENERATION BY PLANKTON IN SEAWATER SAMPLES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
W. G. Harrison, E. H. Renger, and R. W. Eppley.
Marine Science Communications, Vol 4, No 1, p 13-22, 1978. 3 fig, 1 tab, 14 ref.

Descriptors: *Mercury, *Toxicity, *Nitrates, *Ammonia, *Bacteria, *Phytoplankton, *Phosphates, Enzymes, Metabolism, *Absorption, *Inhibition, *Zooplankton, Biological communities, *Nitrogen, Path of pollutants, Ecosystems, *Controlled experimental ecosystems.

Additions of mercury at concentrations greater than 1 microgram/liter -1 to natural samples of coastal seawater resulted in the inhibition of nitrate and ammonia assimilation (by phytoplankton) and ammonia regeneration (by bacteria and/or microzooplankton) in short-term (24-48 hr) experiments. Phosphate uptake was similarly affected. Synthesis of nitrate reductase was stimulated by low concentrations of mercury and inhibited by higher concentrations (greater than 1 microgram/liter -1). (EIS-Deal)
W78-08961

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VI. DENITRIFICATION BY MARINE BACTERIA,
Tokyo Univ. (Japan). Ocean Research Inst.
I. Koike, A. Hattori, and J. J. Goering.
Marine Science Communications, Vol 4, No 1, p 1-12, 1978. 4 fig, 1 tab, 13 ref.

Descriptors: *Mercury, *Nitrates, *Denitrification, *Bacteria, *Radioactivity techniques, *Tracers, *Saturation, *Adaptation, *Biological communities, Path of pollutants, Ecosystems, Eutrophication, *Controlled experimental ecosystems, *Selection.

Sixty-two day effects of 5 micrograms/liter -1 mercury on denitrification by natural populations of marine bacteria in large volume (1300 m3) Controlled Experimental Ecosystems (CEES) were investigated using 15N labeled nitrate as a tracer. Denitrifying activities, i.e., N2 production, 27 days after addition of mercury were similar in bottom water and in newly formed sediments in a CEE containing 5 micrograms/liter -1 mercury (Hg CEE) and one with no mercury (Control CEE). After 62 days the denitrifying activity in Hg CEE sediments exhibited a six fold higher half saturation constant (Km) for nitrate than did the control CEE sediments. Apparently a selection for denitrifying bacteria with a high Km occurs when natural populations of marine denitrifiers are exposed to 5 micrograms/liter -1 mercury for two months.
W78-08962

STUDIES IN COPPER METABOLISM IN FISHES - III. EXISTENCE OF METALLOTHIONEIN-LIKE PROTEIN IN CARP HEPATOPANCREAS (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Fisheries.
Y. Yamamoto, T. Ishii, and S. Ikeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 44, No 2, p 149-153, 1978. 1 tab, 5 fig, 13 ref.

Descriptors: Biochemistry, Fish physiology, *Copper, *Carp, *Metabolism, *Zinc, *Proteins, Separation techniques, *Bioassay, Metals, Analytical techniques, Chromatography, Biological properties, Chemical properties, Freshwater fish, Environmental effects, *Copper-binding protein, Induction, Sub-lethal effects.

The present study was undertaken to determine the appearance of copper-bound metallothionein in the hepatopancreas of carp kept in an 0.1 ppm copper solution for 2 weeks. The hepatic soluble fraction from control and copper-exposed fish were gel-filtrated on a Sepahadex G-75 column, and the following results were obtained. (1) Copper as well as zinc was eluted in two fractions and most of the copper appeared in the second fraction (F-2) in the control. (2) Copper and free SH-group contents in F-2 from copper-exposed fish significantly increased as compared to those from control fish. (3) By incubation of the soluble fraction with p-chloromercuribenzoic acid it was shown that copper, zinc and free SH-groups diminished in F-2 from copper-exposed fish. (4) When the soluble fractions from control and copper-exposed fish were incubated with copper, incorporation of the additive copper into F-2 was much higher in the copper-exposed fish than the control. In addition, the zinc in F-2 was replaced by copper and the free SH-groups in this fraction disappeared. (5) The molecular weight of F-2 was estimated to be about 10,000 by gel-filtration on Sephadex G-75. These findings indicaate that, in carp hepatopancreas, copper induces the synthesis of a copper-binding protein which can be identified as a metallothionein-like protein. (EIS-Katz)
W78-08963

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - II. DISTRIBUTION OF HYDROCARBON-OXIDIZING BACTERIA IN THE OIL-POLLUTED AREAS CAUSED BY THE MIZUSHIMA OIL REFINERY ACCIDENT (IN JAPANESE),
Simonoseki Univ. of Fisheries (Japan).
H. Fujisawa, M. Murakami, and T. Manabe.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 44, No 2, p 91-104, 1978. 5 fig, 1 tab, 28 ref.

Descriptors: *Oil spills, *Biodegradation, *Microbial degradation, *Self-purification, Biological communities, Populations, *Marine bacteria, *Seasonal, *Water pollution effects, Oil, Sediments, Microorganisms, Water quality, Aquatic bacteria, Water pollution sources, Bottom sediments, *Straits of Bisan(Japan), *Hydrocarbon-oxidizing bacteria.

The distribution of hydrocarbon-oxidizing bacteria and heterotrophic bacteria in the Straits of Bisan were investigated for one year to assess bacteriological self-purification of the areas following a spill of 7500 to 9500 kl of a heavy oil from the Mizushima Oil Refinery. The populations of heterotrophic bacteria, hydrocarbon-oxidizing bacteria Groups A and B per ml of seawater were 10 to the 2nd power, to 10 to the 5th power, 10 to 10 to the 5th power, and 10 to 10 the 4th power, respectively, and their populations per g of bottom sediments were 10 the 4th power, to 10 the 6rth power, 10 the the 3rd power, to 10 the 6th power, and 10 to the 3rd power, to 10 to the 5th power. The population density of hydrocarbon oxidizers Group A was higher than that of Group B in both seawater and bottom sediments of surveyed areas. The ratio of the number of hydrocarbon oxidizers (Group B) in bottom sediments of the Straits of Bisan to that of heterotrophic bacteria was higher than the ratio in other areas unaffected by accidental oil spills. On the basis or these and other results, it may be said that these hydrocarbon oxidizers contribute to decomposing oil pollutants in these oil-polluted areas. (EIS-Katz)
W78-08964

COMPARATIVE ECOPHYSIOLOGY OF GAMMARIDS (CRUSTACEA: AMPHIPODA FROM MARINE, BRACKISH-AND FRESH-WATER HABITATS EXPOSED TO THE INFLUENCE OF SALINITY-TEMPERATURE COMBINATIONS. IV. BLOOD SODIUM REGULATION,
Amsterdam Univ., (Netherlands). Lab. of Aquatic Ecology.
J. Dorgelo.
Netherlands Journal of Sea Research, Vol. 11, No. 2, 1977, p 184-199, 3 fig, 2 tab, 73 ref.

Descriptors: *Environmental effects, *Salinity, *Temperature, Physiology, *Amphipoda, *Crustaceans, Ecology, Sea water, Brackish water, Freshwater, Water pollution effects.

Blood sodium regulation as a function of salinity and temperature was determined for the test species (Chaetogammarus marinus, Gammarus tigrinus, and G. fossarum) to obtain quantitative data on their regulatory characteristics in relation to the salt regime in which they occur in nature. The three species were found to be hypersomatic over the whole salinity range, tested at 5, 15, and 25C, except for G. fossarum in supranormal, potentially lethal salinities. They showed hyperregulation at homoiosmotic levels that decrease from coastal to brackish water to fresh water origin. Temperature influence on the level of regulation had no ecological implications for the populations of the three species. In its osmotic regulation G. tigrinus resembled C. marinus more than G. fossarum. Small males of C. marinus had a higher blood sodium content than larger ones. (See also W77-07397) (Chilton-ORNL)
W78-08965

MARINE DIATOMS GROWN IN CHEMOSTATS UNDER SILICATE OR AMMONIUM LIMITATION. III. CELLULAR CHEMICAL COMPOSITION AND MORPHOLOGY OF CHAETOCEROS DEBILIS, SKELETONEMA COSTATUM, AND THALASSIOSIRA GRAVIDA,
Washington Univ., Seattle. Dept. of Oceanography.
P. J. Harrison, H. L. Conway, R. W. Holmes, and C. O. Davis.
Marine Biology, Vol. 43, No. 1, 1977, p 19-31, 1 fig, 4 tab, 47 ref.

Descriptors: Environmental effects, *Nutrients, Nutrient removal, *Diatoms, Phytoplankton, *Ammonium compounds, *Silicates, Cytological studies, Plant morphology, Water pollution effects.

The test species used in this study were grown under conditions of no limitation and ammonium or silicate limitation or starvation. Distinct differences in cell morphology resulted under the different conditions. Morphological changes in starved cells were not as striking as in limited cells. In all species, cell volume was largest in non-limited cells. Cells grown under silicate starvation showed an increase in carbon, chlorophyll a, nitrogen and phosphorus and a small decrease in silica, on a per cell volume basis. Under silicate limitation the cells showed a similar pattern. Ammonium limitation resulted in a decrease in chlorophyll a, carbon and nitrogen per unit cell volume. Cells grown under ammonium starvation showed similar trends to those under ammonium limitation, except that carbon, silica, phosphorus, and nitrogen per unit cell volume were higher. (Chilton-ORNL)
W78-08967

WATER QUALITY OF THE OHIO RIVER, LOUISVILLE, KENTUCKY-EVANSVILLE, INDIANA.
National Field Investigations Center-Cincinnati, OH.
For primary bibliographic entry see Field 5B.
W78-08989

ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1976,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W78-09060

THE TOXICITY OF THE RIOT CONTROL AGENT CS (O-CHLOROBENZYLIDENE MALONONITRILE) AND ITS HYDROLYSIS PRODUCTS TO THE MUMMICHOG, FUNDULUS HETEROCLITUS (LINNAEUS),
Edgewood Arsenal, Aberdeen Proving Ground, MD. Biomedical Lab.
J. G. Pearson, and R. A. Renne.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 800, Price codes: A02 in paper copy, A01 in microfiche. Technical Report EB-TR-74095, July-November 1971. 25 p, 7 fig, 6 tab.

Descriptors: *Environmental effects, Aquatic environment, *Aquatic habitats, *Toxicity, Aquatic animals, Chemical properties, Chemical wastes, Runoff, Estuarine environments, Chemcontrol, O-chlorobenzylidene malononitrile, *Chemical safety investigations, O-chlorobenzaldehyde, *Malononitrile, *Mummichog, Morphological effects, Histological effects, Riot control agents, Carroll Island(MD).

The study was undertaken to determine the aquatic toxicity of CS (O-Chlorobenzylidene Malononitrile) and its hydrolysis products (o-chlorobenzaldehyde and malononitrile). CS is a riot control agent and it had been thought that its release into the environment might have deleterious effects on aquatic species. The mummichog was used as the experimental animal because it was a fish representative of the estuarine environment near Carroll Island, Edgewood Arsenal's main outdoor test facility, where the experimental testing had been done from July 1964 to December 1971. Since the water runoff from the testing areas emptied into Hawthorne Cove, the agents disseminated there were potentially harmful to the aquatic environment surrounding Carroll Island. O-Chlorobenzaldehyde was found not to be acutely toxic at 35.0 mg/l and caused no detectable behavioral, morphological or histological effects on the mummichog. The threshold LC50 (median lethal threshold concentration) for CS was 3.9 mg/l, causing external hemorrhages, secretion of copious amounts of mucus and disruption of the epithelium and gill filaments. The threshold LC50 for malononitrile was 0.7 mg/l; no histological or morphological effects were observed. Because of its toxilogical properties, contamination of aquatic environments should be minimized or eliminated during manufacturing, testing, field use or disposal of CS. The amount of CS tested on any given day at Carroll Island and the climatic conditions which prevailed at the time of testing make it highly improbable that any adverse environmental effects on the surrounding waters took place. (Zayac-NC)
W78-09063

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
For primary bibliographic entry see Field 6G.
W78-09070

PRIMARY PRODUCTIVITY OF COASTAL MARSHES IN MISSISSIPPI,
Mississippi State Univ., Mississippi State, Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-09079

PRODUCTIVITY RELATIONS IN A CAREX-DOMINATED ECOSYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-09081

NITROGEN FIXATION IN A SALT MARSH,
Lancaster Univ., Bailriggs (England). Dept. of Biological Sciences.
K. Jones.
Journal of Ecology, Vol. 62, No. 2, p 553-565, July 1974. 13 tab, 24 ref.

Descriptors: *Salt marshes, *Nitrogen fixation, *Cyanophyta, *Nitrogen fixing bacteria, Nitrogen, Marshes.

The amounts of nitrogen fixed by blue-green algae and bacteria in the salt marsh are estimated using the acetylene reduction technique and the fate of this fixed nitrogen is traced by use of 15 N. The salt marsh is divided into four main zones characterized by the higher plants present. Mud samples, selected at random, were taken at monthly intervals from each of the zones of the marsh. Nitrogen fixation was found to occur in all zones of the salt marshes. Blue-green algae in pools and on the banks of creeks fix nitrogen throughout the year whenever the temperature and light intensity permit. Bare areas in the lower marsh become progressively colonized with blue-green algae during the year and maximum rates of nitrogen fixation by bacteria are found in many parts of the marsh but at levels below those for blue-green algae. Nitrogen fixation is stimulated in the rhizosphere of Puccinellia maritima. The products of bacterial and algae nitrogen fixation are rapidly utilized by higher plants in the salt marsh. (Maroncelli-Mass)
W78-09082

NITROGEN FIXATION IN FLAX POND: A LONG ISLAND SALT MARSH,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
D. E. Whitney, G. M. Woodwell, and R. W. Howarth.
Limnology and Oceanography, Vol 20, No 4, p 640-643, July, 1975. 1 fig, 2 tab, 17 ref.

Descriptors: *Nitrogen fixation, *Salt marshes, Nitrogen, Cyanophyta, Marshes, Coastal marshes, *Flax pond, Long Island(New York).

Nitrogen fixation was measured by the acetylene reduction technique during summer 1973. Six areas within the marsh were selected for sampling: panne areas of the high marsh; pools of standing water on the high marsh; sediments beneath stands of Spartina alterniflora; mudflats exposed only at low tide; water from the tidal creeks and channels; and blue-green algal mats of the high marsh. Rates of fixation in the top 4 cm of all sediments ranged from 12 to about 800 micrograms N/sq. m./hour. Fixation diminished with depth with none at 20 cm or below. Blue-green algal mats fixed at rates that ranged from 260-8,900 micrograms N/sq. m/hour. No fixation was detected in the tidal water column, but rates of 8.6 - 4,800 micrograms N/liter/hour occurred in small stagnant pools on the marsh surface. Rates of fixation appeared not to vary between day and night. (Macroncelli-Mass)
W78-09085

A FOUR YEAR ANALYSIS OF VEGETATION FOLLOWING AN OIL SPILL IN A FRESHWATER MARSH,
Smith Coll., Northampton, Mass. Dept. of the Biological Sciences.
C. J. Burk.
Journal of Applied Ecology, Vol 14, No 2, p 515-522, August, 1977. 3 tab, 18 ref.

Descriptors: *Oil spills, *Vegetation, *Freshwater marshes, Effects, Marshes, Wetlands, Oil, Species diversity, Recovery, Oil pollution, *Water pollution effects.

Composition of vegetation was studied for four years following an accidental oil spillage. Total plant cover, total number of species, mean number of species per quadrat and the Shannon-Wiener function progressively reduced in both high and mid-marsh zones for two years after the spillage. Eighteen of the species found before the spill were not found the following season. Perennial species generally were less affected than annual species immediately following the spill. Some species declined in abundance the second season following the spill. Marked changes in relative abundance of the dominant species of high and mid-marsh zones occurred from year to year. The vegetation of the high and mid-marsh zones had substantially recovered by the third and fourth years. Low marsh vegetation was apparently unaffected immediately following the oil spillage but in succeeding years the species diversity declined and luxuriant growth of Elodea nuttallii, Potamogeton crispus and P. epihydrus occurred. These observations to some extend parallel those of workers in salt marshes. (Stihler-Mass)
W78-09086

ACCUMULATION OF DRY MATTER, NITROGEN AND PHOSPHORUS BY CULTIVATED WATER, HYACINTHS,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 5G.
W78-09089

MAN'S INFLUENCE ON THE DEVELOPMENT OF THE ESTUARINE MARSH, FLAX POND, LOND ISLAND, NEW YORK,
New York Univ., NY. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W78-09091

PRODUCTION AND DYNAMICS OF SALT MARSH VEGETATION AND THE EFFECTS OF EXPERIMENTAL TREATMENT WITH SEWAGE SLUDGE: BIOMASS, PRODUCTION, AND SPECIES COMPOSITION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
I. Valiela, J. M. Teal, and W. J. Sass.
Journal of Applied Ecology, Vol. 12, No. 3, p 973-981, December, 1975. 4 fig, 1 tab, 32 ref.

Descriptors: *Salt marshes, *Productivity, *Primary productivity, *Sewage sludge, Rooted aquatic plants, Wetlands, Plant morphology, Nitrogen, Ferilization, Standing crops.

Fertilization with a 10-6-4 sewage sludge fertilizer increased total peak standing crops of salt marsh vegetation in spite of the presence of considerable amounts of heavy metals and chlorinated hydrocarbons in the sludge. Standing crop increases were detected in the second year of treatment and remained for three years of treatement. Spartina alterniflora, the dominant species in low marsh areas, progressively excluded Salicornia spp. from fertilized plots after an initial increase of Salicornia. In high marsh areas, fertilization initially increased the standing crop of Distichlis spicata but this was later replaced by Spartina patens. S. alterniflora did not respond to fertilization in the high marsh. The amount of dead matter was highest in the fall and decreased slowly to a low point in midsummer. Productions achieved by the most heavily fertilized plots are among the highest recorded for marsh plants. Results suggest that dwarf and tall forms of S. alterniflora are a response to nitrogen supply. (Stihler-Mass)
W78-09099

DECOMPOSITION OF SALT MARSH GRASS, SPARTINA ALTERNIFLORA LOISEL,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 2I.
W78-09102

TROPHIC RELATIONSHIPS IN A SEAGRASS COMMUNITY (THALASSIA TESTUDINUM), IN CARD SOUND, FLORIDA. FISH DIETS IN RELATION TO MACROBENTHIC AND CRYPTIC FAUNAL ABUNDANCE,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2I.
W78-09103

COASTAL MARSH PRODUCTIVITY: A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
Fish and Wildlife Service, Biological Services Program, FWS/OBS-77/3, October, 1977, 300 p.

Descriptors: *Bibliographies, *Coastal marshes, *Productivity, Marshes, Wetlands, Primary productivity, Aquatic plants, Swamps, Food chains, Detritus, Decomposing organic matter, Wildlife, Fish, Mammals, Birds, Reptiles, Invertebrates, Estuaries.

The bibliography consists of five major sections: Marshes and Marsh Vegetation; Primary Productivity of Marsh Plants; Detritus in the Food Chain; Marsh Estuaries as Fish Havens; and Marshes as habitat and Feeding Grounds for Wildlife. Each of the major sections is divided into subsections. Each of the 401 entries includes an abstract and a list of keywords. Also included are author, scientific name, and keyword indices. (Stihler-Mass)
W78-09108

PRELIMINARY STUDIES ON CHITIN DECOMPOSITION IN LAKE ERIE SEDIMENTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
C. E. Warnes, and C. I. Randles.
Ohio Journal of Science, Vol. 77, No. 5, p 224-230, 1977. 5 fig, 17 ref.

Descriptors: *Lake sediments, *Lake Erie, *Sediments, *Chitin, *Degradation(Decomposition), *Bacteria, *Cycling nutrients, Great Lakes, Sediment-water interfaces, Microorganisms, Aerobic conditions, Anaerobic conditions, Ammonia, Ecosystems, Heterotrophy, Lakes, Nitrogen, Carbon, Nutrients, Succession.

In an October 1973 study, about 10% of heterotrophic bacteria found in sediments from the western basin of Lake Erie were able to decompose chitin. Chitin decomposition is important in the aquatic ecosystem because of the large quantity present and its relatively high nitrogen content. Release from the chitin of organically-bound nitrogen, as well as carbon, is a significant factor in carbon and nitrogen cycling in the ecosystem, and bacterial activity is the primary means of chitin decomposition. Sediment core samples were collected in 6.1 m of water 30 mi north of Rattlesnake Island. Slides coated with chitin purchased from a supply house were buried in mud dredged from the same collection site. Enumeration studies of sediment indicated the presence of about one million heterotrophic bacteria/ml, of which 10% displayed chitinolytic ability. The chitin-coated slides immersed in a mud jar gave preliminary evidence of a succession of microorganisms active in chitin degradation in both the aerobic (cocci to curved rods) and anaerobic (vibrioids to spiral and vibrioids forms) zones of the sediment column. Enrichment studies of frozen core sections showed potential activity of microorganisms in the sediments to degrade chitin with ammonia release. Tests for release of the subunit of chitin, N-acetylglucosamine, from enriched sediments were not successful. (Lynch-Wisconsin)
W78-09152

1977 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Ministry of Agriculture, Atrim (Northern Ireland). Freshwater Biological Investigation Unit.
Annual Report Research and Technical Work 1977, Department of Agriculture for Northern Ireland, Freshwater Biological Investigation Unit. 21 p, 13 fig, 3 tab.

Descriptors: *Northern Ireland, *Lough Neagh(Northern Ireland), *Eutrophication, *Phosphorus, *Limiting factors, *Phytoplankton, Zooplankton, Lakes, Algae, Fertilizers, Nitrates, Lough Erne(Northern Ireland), Antrim Bay(Northern Ireland), Orthophosphorus, Cyanophyta, Light, Darkness, Nutrients.

Research conducted in 1977 by the Freshwater Biological Investigation Unit of the Department of Agriculture, Northern Ireland, shows that in Lough Neagh a decline in phosphorus content of the algae is the only reliable index of phosphorus limitation. Observations of changes in soluble phosphorus fractions in the water column did not produce a good index. Established in 1968 to study causes of algal blooms in Lough Neagh, the unit has widened its scope to other water bodies in Northern Ireland with similar problems. Sampling of Lough Erne and its inflowing rivers was completed in 1976, but data is still being evaluated; export of soluble phosphorus fractions from different catchments correlates well with human population densities, a result also found in the Lough Neagh system. Algal distribution was mapped using a flow-through fluorometer system for measuring chlorophyll-a. Water depth appears to have a predominant influence on algal density. In Lough Neagh phosphorus loading consists of about 50% soluble orthophosphorus, 20% soluble organic phosphorus, and 30% particulate phosphorus. Bioassays show that only a small fraction of soluble organic phosphorus is available for organic growth, and the particulate fraction may be unimportant as a nutrient; soluble orthophosphorus is the important available phosphorus fraction for algal growth. (Lynch-Wisconsin)
W78-09153

AQUATIC PLANTS: MANAGEMENT AND CONTROL,
Pennsylvania State Univ., University Park. Agricultural Extension Service.
R. G. Wingard, T. D. Rader, W. K. Hock, and R. B. Hesser.
Natural Resource Series, Special Circular 222. 18 p. (1977).

Descriptors: *Aquatic weed control, *Chemcontrol, *Mechanical control, *Environmental control, *Herbicides, *Aquatic plants, Submerged plants, Algae, Phytoplankton, Food chains, Fishkill, Oxygen depletion, Fertilization, Pennsylvania, Management, Water management(Applied), Plant growth.

A description of methods for management and control of aquatic plants, especially in Pennsylvania, supplemented by an illustrated catalog of 31 problem plants. An insert entitled 'Aquatic Plant Herbicides' reproduces the plant illustrations and lists effective herbicides. The booklet discusses: growth of algae and flowering aquatic plants (submergents, emergents, and floaters); the role of plants in energy, the food chain, animal habitats, filling of ponds and lakes, and oxygen depletion. Control methods include mechanical, environmental, and chemical means. Physical removal is most effective for small quantities of plants near shorelines, and consists of cutting, mowing, raking, digging, or pulling. The treatment must usually be repeated. Thin sheets of black plastic help discourage plant growth in small ponds and around boat docks. An environmental method, which offers the most permanent weed control, involves deepening the lake or pond to over 10 feet; sunlight seldom penetrates sufficiently to this depth for plant growth. Drawdown can be effective but the danger of oxygen depletion increases when fish and organic debris are concentrated in a smaller volume of water. Fertilization may stimulate the growth of plankton, thus restricting light penetration and inhibiting photosynthesis, but fertilization may increase rather than reduce the weed problem. Herbicide dosage and application are discussed. (Lynch-Wisconsin)
W78-09154

DISTRIBUTION AND BIOTIC EFFECTS OF NUTRIENTS IN FLATHEAD LAKE, MONTANA,
Montana Univ., Flathead Lake. Biological Station.
A. R. Gaufin, J. A. Stanford, and J. F. Tibbs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 271, Price codes: A05 in paper copy, A01 in microfiche. January 1975. 96 p, 13 fig, 8 tab, 41 ref, 2 append.

Descriptors: *Flathead Lake(MT), *Phosphorus, *Phytoplankton, *Nutrients, *Metabolism, *Eutrophication, *Baseline studies, Nitrogen, Trophic level, Oligotrophy, Algae, Rivers, Watersheds(Basins), Lakes, Water pollution effects, Bioassay, Light penetration, Suspended solids, Primary productivity, Circulation, Limiting factors, Turbidity.

The absence of algal blooms in Flathead Lake, Montana, despite high inputs of phosphorus, seems due to high iron concentration, constantly oxygenated water, and high levels of suspended sediment. These three factors may cause phosphorus to be removed from the photic zone, and suspended sediment in addition decreases light penetration and may even precipitate algae. Phosphorus concentrations in water of the apparently oligotrophic lake were only about 10% of previously reported levels, but sensitivity limits (0.01 mg P/l) were not low enough for accurate determination. Inputs of phosphorus were 1400 lbs/day from the Flathead River and 100 lbs/day from the Swan River. Low phosphorus concentrations in the lake water controlled phytoplankton production, but nitrogen levels did not affect it. This baseline study was undertaken to describe seasonal dynamics of various physical and chemical parameters influencing plankton community metabolism, and to compare results with earlier data on nutrient-loading trends. Flathead Lake is located in northwestern Montana in the upper Flathead River drainage. Its eastern half averages about twice the depth of the western half; max-

imum depth is 110 m, while mean depth is 14 m. Physical parameters evaluated included light, turbidity, circulation, and temperature. Intensive exploitation of the lakeshore for land development has caused concern for water quality. (Lynch-Wisconsin)
W78-09155

PHOSPHORUS FERTILIZATION OF FISH-PONDS IN THE UPPER GALILEE,
Mekorot Water Co., Tiberias (Israel). Lake Kinneret Watershed Lab.
Y. Eren, T. Tsur, and Y. Avnimelech.
Bamidgeh, Bulletin of Fish Culture in Israel, Vol. 29, No. 3, p 87-93, September 1977. 4 fig, 4 tab, 5 ref.

Descriptors: *Galilee(Israel), *Phosphorus, *Ponds, *Fish farming, *Aquiculture, Eutrophication, Nutrients, Lake Kinneret(Israel), Lakes, Microcystis, Algae, Cycling nutrients, Chlorophyll, Cyanophyta, Phosphates, Superphosphate, Sediments, Nutrient flux, *Fertilization.

Fertilizing fish-farming ponds in upper Galilee (Israel) with superphosphate, and supplying additional phosphorus in feed, results in an oversupply of phosphorus which contaminates Lake Kinneret upon drainage of the ponds. Pond no. 6 with an area of five ha and an average depth of one m, was sampled May-December 1973. Inorganic phosphorus in the form of superphosphate was added weekly at 30 kg P/ha. Phosphorus equilibrium in the sediment-water system was studied in adjacent pond no. 2, which was drained and filled with fresh spring water. The constant level of soluble inorganic phosphorus even during peak algal bloom (July-September) indicates that algae have a steady supply of available phosphorus. Pond no. 2 contained the same algal population as pond no. 6, primarily cyanophytes of the genus Microcystis. Phosphorus concentration in algae demonstrates that the algae are growing in a non-phosphorus-limiting medium. It is recommended that fertilization be stopped in ponds in which adequate amounts of phosphorus have accumulated at the bottom. After fertilization of pond no. 6 the increase in soluble phosphorus was only about 10% of the phosphorus applied; the rest precipitated and settled to the bottom. Pond water attained equilibrium with sediment at soluble inorganic phosphorus levels of about 100 g/l. When water is deficient in phosphorus, the latter is released from the bottom until equilibrium is achieved. (Lynch-Wisconsin)
W78-09156

OBSERVATIONS ON THE USE OF ORGANIC FERTILIZERS IN INTENSIVE FISH FARMING AT THE GINOSAR STATION IN 1976,
Intensive Fish Culture Station Ginosar (Israel).
U. Rappaport, S. Sarig, and Y. Bejerano.
Bamidgeh, Bulletin of Fish Culture in Israel, Vol. 29, No. 2, p 57-70, June 1977. 1 fig, 7 ref.

Descriptors: *Fish farming, *Fertilizers, *Chicken droppings, *Manure, *Ginosar(Israel), Carp, Tilapia, Fertilization, Livestock wastes, Seasonal, Feeds, Superphosphate, Phytoplankton, Algae, Zooplankton.

Tests of four types of fertilizers in 0.02 ha fish farming ponds in Ginosar, Israel stocked with monocultures of carp and tilapia showed that a solution of chicken droppings at 5 kg dry matter/ha/day was the most effective in increasing yield (24%), lowering the feed conversion ratio (0.8 units), and reducing feed and fertilizer cost per kg fish (52%). Other organic fertilizers tested in the ponds were liquid cattle manure and corral cattle manure (same application rate as chicken droppings), and a chemical fertilizer containing a daily application of 300 g superphosphate and 400 g ammonium sulfate per pond (five days per week). Corral manure reduced yield by 3%. The experiments were carried out over three seasons with carp, and two seasons with tilapia. During the first season, with fish density at 45,000 fish/ha, fertilizers had little effect as fish growth was low; during subsequent seasons fish density was reduced to 20,000/ha. Tilapia were tested only with chicken droppings and liquid cattle manure. Fertilizer addition was effective in summer, less so in fall, and had no effect in spring when the ponds contain ample supplies of natural feed. Prior to the pond experiments, preliminary observations were made with tanks free of fish to study properties of the fertilizers and their effect on the oxygen regime and development of fish feed animals. Phytoplankton and zooplankton samples were also taken during the pond tests. (Lynch-Wisconsin)
W78-09157

OBSERVATIONS OF ALGAL ZONATION RESULTING FROM COMPETITION,
Washington Univ., Seattle. Dept. of Oceanography.
T. Hruby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 568, Price codes: A02 in paper copy, A01 in microfiche. Estuarine and Coastal Marine Science, Vol. 4, p 231-233, 1976. 1 tab, 8 ref.

Descriptors: *Idiadaea cordata, *Laminaria saccharina, *Distribution patterns, *Competition, *Pacific Northwest U.S., *Coasts, San Juan Island(WA), Algae, Phaeophyta, Rhodophyta, Zonation, Estuaries, Kelps, Spores, Aquiculture, Light.

The red alga Idiadaea cordata was excluded from areas below its normal distribution by competition with more rapidly growning kelps, especially Laminaria saccharina, in experiments conducted in Washington coastal waters. In areas cleared of kelps, I. cordata grew to cover 20% of the bottom from natural spores settlement. In protected coastal waters of Washington and British Columbia (Canada) beds of economically important I. cordata are not found lower than 1.0-1.5 m below Mean Lower Low Water (MLLW), though transplants are known to grow to five m below MLLW, with optimal growth at three m. In this study a square plot of about three sq m on the north side of Turn Point, San Juan Island, San Juan Archipelago, Washington was cleared of foliose brown algae (Phaeophyta) in April 1973, and weeded monthly. The plot, 1.3-1.5 m below MLLW, was in the previous year in the middle of an extensive L. saccharina bed; the I. cordata boundary was one m below MLLW. The five weeded 0.25-sq m quadrats in the plot showed a statistically significant ($P < or = 0.05$ for May, June, and September) increase in I. cordata growth compared with controls. Competition for light appeared to be the mechanism for competitive exclusion, as the larger kelps shaded I. cordata. Other species found in the weeded plot but not in controls included Polyneura latissima, Neoagardhiella baileyi, Rhodymenia palmata, and Desmarestia sp. (Lynch-Wisconsin)
W78-09159

LACK OF CORRELATION BETWEEN THE COMPOSITION OF SEDIMENTS AND THEIR TOXICITY TO ALGAE,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
For primary bibliographic entry see Field 5A.
W78-09160

PREIMPOUNDMENT AND IMMEDIATE POST IMPOUNDMENT ADENOSINE TRIPHOSPHATE CONCENTRATIONS IN SOUTHERN INDIAN LAKE: 1975, 1976,
Fisheries and Marine Servie, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5A.
W78-09161

PHYTOPLANKTON GROWTH AND CHLOROPHYLL LEVELS IN THE SACRAMENTO - SAN JOAQUIN DELTA THROUGH SAN PABLO BAY,
Bureau of Reclamation, Sacramento, CA. Mid-Pacific Region.
M. D. Ball.
U.S. Department of Interior, Bureau of Reclamation, May 1977. 96 p, 33 fig, 7 tab, 27 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *San Pablo Bay(CA), *Sacramento-San Joaquin Delta(CA), *Diatoms, *San Francisco Bay, *Eutrophication, Suisun Bay(CA), Suisun Marsh(CA), Algae, Bays, Deltas, Rivers, Chlorophyta, Sacramento River(CA), San Joaquin River(CA), Seasonal, Waste water disposal, Nutrients, Water pollution effects.

Data on phytoplankton standing crop as measured by chlorophyll-a, collected between 1969-74 in the Sacramento-San Joaquin Delta, Suisun Marsh, Suisun Bay, and San Pablo Bay (California), are summarized and evaluated. Samples were collected at high slack tides three ft below surface with submersible pumps or Van Dorn samplers. Dominant phytoplankters throughout the delta and into San Pablo Bay were diatoms; green algae seldon exceeded 20% of the total. Planktonic chlorophyll-a concentrations in the Sacramento River, the major water source to the delta, were generally under six micrograms/l. During spring, summer, and fall the shallow San Joaquin River contained a very high percentage of wastewater; peak summer chlorophyll concentrations were 100-250 micrograms/l, inversely related to river-flow. Most of this highly productive water was drawn to the export pumps during the summer. In the eastern delts sloughs and channels, chlorophyll levels were often quite high and varied erratically. Spring blooms of 30-40 micrograms/l and summer blooms of 40-100 micrograms/l were observed in the Suisun Bay area. Chlorophyll-a concentrations in Suisan Marsh generally peaked in late spring at the 40-100 micrograms/l range. In the channel through San Pablo Bay chlorophyll levels seldom exceeded six micrograms/l. Of total chlorophyll-a plus pheo-pigments, chlorophyll-a near the water surface amounted to 50-80% during spring-fall throughout the study area. (Lynch-Wisconsin)
W78-09163

INORGANIC PHOSPHORUS FRACTIONATIONS IN BLACKSTRAP LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
C. P. Hwang.
Water Research, Vol. 11, No. 10, p 945-946, 1977. 1 fig, 7 ref.

Descriptors: *Lake sediments, *Blackstrap Lake(Saskatchewan Canada), *Phosphorus, *Inorganic compounds, *Sediments, *Particle size, Canada, Saskatchewan(Canada), Reservoirs, Water supply, Nutrients, Hydrogen ion concentration, Aluminum, Iron, Calcium.

Inorganic phosphorus fractions (aluminum-phosphorus, iron-phosphorus, calcium-phosphorus) and their distribution characteristics in various fractions of the sediments of Blackstrap Lake (Saskatchewan, Canada) were determined. The lake is the largest reservoir in the Saskatoon Southeast water supply system. Results show the inorganic fraction is not only in colloidal < 2 micrometer fractions, but also in coarse > 50 micrometer fractions. Sediments were collected with an Ekman dredge in July 1972 at six locations. Samples were mixed to make composite, dispersed in distilled water, and separated into $>$ 50, 50-20, 20-5, 5-2, 2-0.2, and < 0.2 micrometer fractions. The percentage of different size fractions were 27.4, 31.3, 11.3, 3.2, 12.4, and 14.4 respectively. Al-P, Fe-P, and Ca-P of various size fraction sediments were then fractionated. The Ca-P combination was the principle factor in the control of inorganic phosphorus in the sediments.

Enrichment of Ca-P, Fe-P, and Al-P occurred mostly in the sand (> 50 micrometer) fractions and clay (2-0.2 and < 0.2 micrometer) fractions. Calculation of the sum of the Al-P, Ca-P, and Fe-P fractionations in various sized fractions yielded 67.6%, 73.6%, and 136.5% respectively. The pH of the sediments was about 7.3. (Lynch-Wisconsin)
W78-09164

EFFECTS OF SOME UNICELLULAR ALGAE ON ESCHERICHIA COLI POPULATIONS IN SEA WATER AND OYSTERS,
Tasmania Univ., Hobart (Australia). Faculty of Agricultural Science.
R. K. Brown, T. A. McMeekin, and C. Balis.
Journal of Applied Bacteriology, Vol 43, No 1, p 129-136, August 1977. 4 fig, 3 tab, 10 ref.

Descriptors: *Dimethyl-beta-propiothetin, *Acrylic acid, *Phaeodactylum tricornutum, *Oysters, *Sea water, *E. coli, *Coliforms, *Public health, Algae, Pavlova lutheri, Australia, Tasmania(Australia), Filter feeders, Crassostrea gigas, Water pollution effects, Water pollution control, Toxins, Nutrients, Microorganisms.

Acrylic acid, liberated on the death of such unicellular algae as Phaeodactylum tricornutum containing dimethyl-beta-propiothetin (DMPT), exhibited anticoliform activity in tests with seawater and oysters. The alga caused a rapid decline of Escherichia coli populations in seawater in dialysis tube experiments, and when fed to stored oysters caused a lower but consistent decline of E. coli. Another alga, Pavlova lutheri, which does not contain DMPT, was ineffective against E. coli. Oysters are usually cultured commercially in estuarine waters often contaminated by sewage and industrial wastes. The filter-feeding oysters concentrate microorganisms from the surrounding waters, including Salmonella, Shigella, enteropathogenic E. coli, and enteric viruses. As oysters are often eaten raw, a health hazard may occur. Dimethyl sulfide and acrylic acid are liberated by cleavage of DMPT on death of algal cells, and acrylic acid will therefore be present when dimethyl sulfide and DMPT are detected together. E. coli strain M13 was used as the test organism. Pacific oysters, Crassostrea gigas, grown in southern Tasmania (Australia) in waters free of serious heavy metal contamination, were used in all experiments. E. coli survival was tested in oyster culture seawater, algal cultures and filtrates, acrylic acid solutions, and in oysters. (Lynhc-Wisconsin)
W78-09165

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUALIFICATION,
National Aeronautics and Space Asministration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-09166

DETERMINATION OF THE RATE AND EFFICIENCY OF NITROGEN TRANSFER FROM PHYTOPLANKTON TO ZOOPLANKTON USING NITROGEN-15 AS A TRACER,
Columbia Univ., New York. Teachers Coll.
V. M. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-3222-04, Price codes: A02 in paper copy, A01 in microfiche. Report COO-3222-04, February 1976. 55 p, 5 fig, 16 tab, 13 ref, 1 append. Atomic Energy Commission E (11-1)3222.

Descriptors: *Nitrogen cycle, *Phytoplankton, *Zooplankton, *Tracers, *Trophic level, Efficiency, Nutrient flux, Age, Primary productivity, Nitrogen fixation, Nitrogen, Chlorophyll, Radioisotopes, New York, Coasts.

Rate and efficiency of assimilated nitrogen transfer from the first trophic level, or producer (phytoplankton), to the second, or primary consumer (zooplankton) in the natural marine environment was traced with nitrogen-15-labelled phytoplankton. A one-cu m Polytank was used to contain the community. Zooplankton were collected using a dipping barrel on the Continental Shelf 30 mi east of Ambrose Light, New York in 1972-73. Assimilated transfer rates were 0.334 (December 1972), 1.792 (April 1973), and 0.261 (September 1973) gram-atoms of phytoplankton nitrogen per gram-atom of zooplankton nitrogen per day. The variability of rates seems related to the age frequency distribution of the zooplankton population. The first and third collections were made when the zooplankton populations probably consisted mostly of adults in a metabolic state of balance, while the April collection was made when the population probably contained many juveniles which would incorporate greater quantities of nitrogen than adults. Assimilation efficiencies ranged from 25.4-66.1%. The range agrees with rates reported in the literature. Calculation of assimilation efficiency for the second experiment was based on direct measurements of phytoplankton nitrogen content using Kjeldahl analysis, and the figure of 66.1% is therefore considered the most accurate. (Lynch-Wisconsin)
W78-09167

DIFFERENCES IN CARRAGEENAN IN GAMETOPHYTES AND TETRASPOROPHYTES OF RED ALGAE,
Washington Univ., Seattle. Div. of Marine Resources.
R. J. Waaland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 015, Price codes: A02 in paper copy, A01 in microfiche. Phytochemistry, Vol 14, p 1359-1362, 1975. 4 tab, 15 ref.

Descriptors: *Carrageenan, *Gametophytes, *Tetrasporophytes, *Rhodophyta, *Iridaea cordata, *Food processing industry, Algae, *Washington, Pacific Ocean, Oceans, Aquiculture, Cytological studies, Iridaea heterocarpa, Iridaea lineare, Iridaea cornucopiae, Gigartina exasperata, Gigartina papillata.

Carrageenan yield in six species of marine red algae (rhodophytes) collected off the coast of Washington ranged from 52-66%; carrageenan in gametophytes was 93% kappa-carrageenan and in tetrasporophytes was 95% lambda-carrageenan. Carrageenan, commercially valuable in the food processing industry, has usually (in Gigartinales) been fractionated into a potassium chloride-insoluble fraction with high gel strength and low viscosity (kapp-carrageenan) and a KCl-soluble fraction with low gel strength and high viscosity (lambda-carrageenan). Species examined were Iridaea cordata, I. heterocarpa, I. lineare, I. cornucopiae, Gigartina exasperata, and G. papillata. In all species carrageenan accounted for over 50% of plant dry matter; I. cordata averaged 61% of dry weight, while all others together averaged 55%. In I. cordata and I. heterocarpa the gametophytes are known to be haploid and the tetrasporophytes to be diploid; these are the only species for which cytological observations of ploidy levels are available. Except for G. papillata, all species in this study have isomorphic gametophytic and tetrasporophytic phases. That kappa-carrageenan is characteristic of gametophytes (haploids) and lambda-carrageenan of tetrasporophytes (diploids) offers a relatively simple and reliable means of assessing gametophyte/sporophyte ratios and ploidy levels of populations of carrageenan-producing algae. (Lynch-Wisconsin)
W78-09168

PHYTOPLANKTON SPECIES, BIOMASS, AND DIVERSITY IN LAKE LA CALDERA (SIERRA NEVADA, GRANADA, SPAIN),
Granada Univ. (Spain). Dept. of Ecology.
R. Martinez.
Acta Hydrobiologica, Vol 19, No 2, p 95-107, 1977. 8 fig, 3 tab, 16 ref.

Descriptors: *Lake La Caldera(Spain), *Phytoplankton, *Mountains, *Chrysophyta, *Species diversity, *Species composition, Biomass, Lakes, Diversity indices, Sierra Nevada(Spain), Penibetic Mountains(Spain), Basic data collections, Algae, Chromulina microplancton, Alpine, Cyanarcus hamiformis, Floral lists.

Phytoplankton of the high mountain lake, La Caldera, in the Sierra Nevada (Penibetic Mountains, Granada, Spain) were dominated by Chrysophyta, mainly chrysomonads of the genus Chromulina. Diatoms, poorly represented, were found mostly in bottom or littoral communities. Unusual was the presence in important numbers of the cyanophyte Cyanarcus hamiformis (now Gomontiella hamiformis). Cell number, biomass, and Shannon's diversity index were similar to other alpine ecosystems. Lake La Caldera is situated 3050 m above sea level on metamorphic rocks of siliceous origin. This is the first study of phytoplankton in a lake of the Penibetic Mountains, one of the two highest mountain systems in Spain. Sampling was carried out during the ice-free period June-September 1973. Twenty-three species were found, mainly in the nannoplankton and micro-algae range. Larger algae found in the littoral included the desmids Euastrum and Cosmarium, naviculaceae diatoms, and some zygnemales. Highest biomass of the dominant Chrysophyceae was found at the end of July near the bottom; Chromulina microplancton reached 2747 cells/ml at 8 m on 26 July. Chrysophyta are usually found in more acid waters; the pH of Lake La Caldera was 7.2-7.5 during the summer. By the end of the study period C. hamiformis was dominant, with the highest concentration on 12 September at a depth of 1 m (932 cells/ml). Maximum diversity was 2.9 bits/cell (21 August), and the minimum was about 1 bit/cell in July. (Lynch-Wisconsin)
W78-09169

AN INVESTIGATION ON THE MACROFAUNA OF THE RIVER WARTA WITHIN THE CITY OF POZAN,
Polish Academy of Sciences, Poznan. Zaklad Biologii Rolnej.
E. Biesiadka, and K. Kasprzak.
Acta Hydrobiologica, Vol 19, No 2, p 109-122, 1977. 2 fig, 2 tab, 22 ref.

Descriptors: *Warta River(Poland), *Macrofauna, *Poznan(Poland), *Oligochaetes, *Water pollution effects, Sewage disposal, Industrial wastes, Species composition, Species diversity, Faunal lists, Hirudinea, Turbellaria, Mollusks, Crustaceans, Ephemeroptera, Heteroptera, Trichoptera, Coleoptera, Chironomidae.

Although water quality of the River Warta in Poznan, Poland, has been severely degraded by sewage and industrial pollution, no extreme qualitative impoverishment of the macrofauna has resulted. The number of species and abundance has decreased, however, especially in Chironomidae, Ephemeroptera, Trichoptera, Coleoptera, Heteroptera, and Crustacea. Eurytopic species are dominant, and increasing pollution has produced an increase in species and numbers of Oligochaeta. A study in 1974-75 at three stations indicates great adaptive ability of many of the fauna. Of left bank sewage (60% industrial), only about 50,000 cu meters/day is purified before discharge into the river, while about 100,000 cu m/day enter the river without purification. Of 3062 specimens collected, 1750 were identified among 87 species. Oligochaeta dominated quantitatively (31.4%), followed by Chironomidae (19.6%), Mollusca (14.5%), and Hirudinea (12.5%). Chironomids had the greatest number of species, followed by Oligochaeta and Mollusca. Greatest numbers of specimens were collected upstream at

least-polluted Station One; fauna decreased markedly at the other two stations. Nineteen species of Oligochaeta were found at the most polluted station Three, and 16 at Station One. Lowest number of specimens and species were found at Station Two, due to concrete bank reinforcements which destroyed many littoral environments. (Lynch-Wisconsin)
W78-09170

PERIPHYTON OF THE RIVER VISTULA IN THE REGION OF HEATED WATER DISCHARGED FROM THE POWER PLANT AT SKAWINA,
Institute of Meteorology and Water Management, Krakow (Poland).
J. Pudo.
Acta Hydrobiologica, Vol 19, No 2, p 123-144, 1977. 6 fig, 3 tab, 57 ref.

Descriptors: *Periphyton, *Powerplants, *Thermal pollution, *Water pollution effects, *Vistula River(Poland), Skawina(Poland), Rivers, Algae, *Skawinka River(Poland), Heated water, Cooling water, Floral lists, Dissolved oxygen, Water temperature, Eutrophication.

Inflow of heated water to the Vistula and Skawinka Rivers from the Skawina, Poland, power plant caused no periphyton species to be eliminated, but resulted in inhibition or intensification of the growth of several species. Results of the investigation indicate that, in general, an artificial increase in temperature in unpolluted waters stimulates algal development, while in polluted waters such as the upper Vistula specific species are affected selectively. Water temperature in the Vistula below the plant was 6-7.5 C higher than above the plant. Dissolved oxygen at the maximum water temperature (32C) did not fall below 2 mg/l. Species which decreased in abundance due to the thermal increase were Sphaerotilus natans, Diatoma elongatum var. tenue, and Surirella ovata. Those increasing in numbers were Siderocapsa maior, Lagynion subglobosum, Navicula nutica, and N. viridula var. avenacea. Upper Vistula water quality undergoes progressive deterioration due to industrial waste discharges; water quality undergoes progressive deterioration due to industrial waste discharges; this study deals with a polluted 17-km stretch of the river. Seven stations were sampled June 1964 to June 1965. In the study area 224 taxa were identified; diatoms were most numerous with 198 taxa (88.3%), followed by Chlorophyceae (5.9%), Bacteriophyta (2.1%), Cyanophyceae (2.1%), Euglenophyceae (1.2%), and Chrysophyceae (0.4%). Twenty-nine genera of diatoms were identified. (Lynch-Wisconsin)
W78-09171

FURTHER STUDIES UPON HOLOCENE HISTORY OF LAKE JEZIORAK, PART II. COMPARISON OF THE HISTORY OF PARTICULAR BASINS,
Nicolas Copernicus Univ. of Torun (Poland). Dept. of Hydrobiology.
J. S. Mikulski.
Acta Universitatis Nicolai Copenici, Limnological Papers, No 10, p 107-118, 1977. 5 fig, 15 ref.

Descriptors: *Lake Jeziorak(Poland), *Holocene, *Paleolimnology, *Cladocera, *Geologic history, *Basins, *Eutrophication, Lakes, History, Geologic time, Sediments, Biocenosis, Palynology, Zooplankton.

The Holocene history of the various basins of eutrophic Lake Jeziorak, Poland was studied, using in particular remnants of ecological groups of Cladocera found in lake sediments. An attempt was made to trace the sequence of basin formation, as well as biocenotic evolution. Moty Bay behaved during the entire period as a typical, average-sized lake; emergent, reed-type macrophytes were dominant, as evidenced by the preponderance of Cladocera of Group 1, associated with reed-belt periphyton. During the time that Moty Bay was connected with the main channel area, the number of pelagic species dropped significantly, suggesting extensive exchange of water masses. Very thick sediments in the channel appear to have resulted from the inflow of allochthonous matter. A core sample for the northern section of the lake revealed many remains of cladocerans associated with sandy and muddy bottoms. Again during connection with the channel reductions in numbers of pelagic species occurred, but they never disappeared as happened in Moty Bay. Differentiation of the littoral of Moty Bay was very stable. The channel differentiated mostly after Connection I with the northern complex. The northern section was most differentiated during Separation Periods I and II, with considerable mud formation. (Lynch-Wisconsin)
W78-09172

THE INTENSITY OF MULTIPLICATION OF BACTERIA AND BIOMASS PRODUCTION IN THE WATER OF TWO LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
W. Donderski.
Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 3-14, 1977. 3 fig, 2 tab, 34 ref.

Descriptors: *Lake Goplo(Poland), *Lake Jasne(Poland), *Eutrophication, *Mesotrophy, *Bacteria, Biomass, Generation time, Trophic level, Species composition, Seasonal, Cocci, Lakes, Primary productivity.

Bacterial number, generation time, and biomass production were studied in eutrophic Lake Goplo and mesotrophic Lake Jasne, Poland during 1972-73. Greatest numbers in Lake Goplo were found in summer, and in Lake Jasne in spring and autumn. Generation time in Lake Goplo in 1972 was shortest in July (4.2 hrs) and longest in March (51.7 hrs). In 1973 the shortest time was in May (3.6 hrs) and longest in July (23.9 hrs). Bacterial biomass was greatest in Lake Goplo in summer (7.82 mg/l) and least in autumn (0.055 mg/l). Cocci produced the largest biomass (6.29 mg/l) and bacilli the smallest (0.001 mg/l); biomass produced by rods ranged from 0.006-1.18 mg/l. In the Lake Jasne littoral, maximum biomass was in summer (0.54 mg/l) and minimum in spring (0.108 mg/l), while in pelagic water the maximum was in autumn (0.756 mg/l at 3-m depth and 0.708 mg/l at 9 m), and minimum in summer at depths of 3 and 12 m. In Lake Goplo dominant bacteria were cocci (68-98%), followed by rods (27% in spring, 0.8% in autumn); bacilli did not exceed 5%. Lake Jasne bacteria were dominated by nonsporulating rods (59-88%); cocci were most numerous in spring (40%). Bacilli again were the least numerous group (about 4%). These results agree in large part with previous studies. Lake Goplo, with a maximum depth of 16.6 m and a mean depth of 3.6 m, is located in northwestern Poland. Lake Jasne, in the Ilawa Lakeland, has a maximum depth of 20 m and a mean depth of 8.1 m. (Lynch-Wisconsin)
W78-09173

EFFECT OF CADMIUM OF ALKALINE PHOSPHATASE ACTIVITY IN DIFFERENT TISSUE OF LEPOMIS GIBBOSUS L. (PISCES; CENTRARCHIDAE) (IN FRENCH),
Lab. Invest. Endocrinol., Kain (Belgium).
A. Piavaux.
Hydrobiologia 55(3), p 251-256, 1977.

Descriptors: *Enzymes, Metabolism, *Cadmium, *Zinc-metallo-enzymes, Water pollution effects, *Sunfishes, Alkaline phosphatase.

To clarify if the interference of the Zn metabolism by Cd could be correlated to a modification of the activity of Zn-metallo-enzymes, sunfish (L. gibbosus L.) were exposed to different concentrations of Cd. The activity of alkaline phosphatase was determined in various organs of control and Cd-treated fish, together with Cd and Zn concentrations. While Cd accumulation is evident in all organs (particularly in liver and kidney), Zn concentration in treated fish is increased for liver and intestine and decreased for brain. The activity of the enzyme does not follow any systematic trend (increase in liver, decrease in intestine, brain and gills). It does not seem therefore that any competition for the active metabolic sites of alkaline-phosphatase take place in favor of Cd in the principal organs of heavy metal accumulation and/or excretion.--Copyright 1978, Biological Abstracts, Inc.
W78-09175

SANITARY PROTECTION OF WATER BODIES IN CONNECTION WITH EXTRACTION AND ENRICHMENT OF RARE METALS (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
For primary bibliographic entry see Field 5G.
W78-09235

WASTE OIL STUDY, REPORT TO THE CONGRESS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5E.
W78-09240

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF ABATE IN BODIES OF WATER (IN RUSSIAN),
Azerbaijan Research Inst. of Virology, Microbiology and Hygiene, Baku (USSR).
For primary bibliographic entry see Field 5G.
W78-09242

DATA ANALYSIS AND MODEL DEVELOPMENT FOR ECOSYSTEM MANAGEMENT AT LAKE GEORGE, N.Y.,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Electrical and Systems Engineering.
G. Roberts, and F. DiCesare.
Fresh Water Institute Report 77-11, Reprinted from: 1977 Proceedings of the International Conference of Cybernetics and Society, I.E.E.E., New York, N.Y. 6 p, 4 fig, 1 tab, 14 ref. NSF DEB-76-12294.

Descriptors: *Lake George(NY), *Ecosystems, *Water management(Applied), *Methodology, *Model studies, *Data analysis, New York, Data processing, Oligotrophy, Water pollution effects, Lakes, Data collections, Decision-making, Planning, Forecasting.

A construction method for data-based analysis models of lake ecosystems uses modelling research being conducted at Lake George, New York as a case study. It is argued that two other approaches--coupling of complex processing models, and simulation of mass flows among compartments--are research-oriented and not suitable for predictive purposes in environmental management, as they generally are not validated and rely heavily on theory. A six-stem modelling process is envisioned which keeps specific policy issues in mind: (1) The system is analyzed to determine problems, and models of system behavior are examined. (2) Research goals are identified, and desired model capabilities and restrictions determined. (3) Model structure is specified, based on objectives, theories, and data analysis. (4) The model is calibrated; parameter values are determined which best reproduce observed system behavior. (5) The model structure is examined and revised to meet goals. (6) The model is applied to the problem defined in step 1 and evaluated. Data have been collected over the past nine years at Lake George, a large, oligotrophic lake located in the Adirondack Mountains. Current land development could significantly alter the lake's water quality. (Lynch-Wisconsin)
W78-09243

TWO OIL SPILLS - INTERRELATEDNESS OF SOCIOECONOMIC STRUCTURE AND IMPACT ON SEAFOOD MARKETING SYSTEM,
Swedish Water and Air Pollution Research Inst., Stockholm.
L Rosenblum.
Report No. B 411, January 1978. 14 p, 2 fig, 12 ref.

Descriptors: *Oil spills, *Marketing, *Economic impact, *La Coruna(Spain), *Tumaco(Colombia), *Seafood, M/V Urquiola, M/V Saint Peter, Food processing industry, Fisheries, Shellfish, Water pollution effects, Social aspects, Commercial fishing, Pacific Ocean, Harbors, Economics.

Investigations of the impact of major oil spills on the seafood marketing systems in Tumaco, Colombia and La Coruna, Spain demonstrated the interrelations of socioeconomic factors, both in terms of effects on the industry and degree of success of corrective measures. The M/V Saint Peter sank off the coast of Ecuador and Colombia in February 1976, releasing 243,442 barrels of crude oil. In May 1976 the tanker Urquiola foundered and spilled 80,000 tons of crude oil at La Coruna harbor. The Tumaco marketing system, characterized by many fishermen and intermediary buyers conducting numerous small, free transactions, is typical of a subsistence economy. This horizontal market was vulnerable to the spill at both the producer and intermediary buyer levels. The major effect of the spill was a decline in consumer demand due to feared health hazards; no administrative measures were taken. In La Coruna, integration of the sector and government regulation has resulted in a large number of producers required to sell through a single, centralized agency to a small number of large-scale buyers, mostly canneries. Due to the vertical structure and the fact that the buyers are largely canneries and therefore less susceptible to adverse effects than small dealers, the gatherers bore the brunt of the damage, which took the form of a massive shellfish kill. Compensation by authorities covered only a fraction of real losses. (Lynch-Wisconsin)
W78-09244

NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH,
Woods Hole Oceanographic Institution, Woods Hole, MA.
G. R. Hampson, and E. T. Moul.
Journal of the Fisheries Research Board of Canada, Vol 35, p 731-744, 1978. 10 fig, 1 tab, 18 ref, append.

Descriptors: Oil, *Oil pollution, *Oil spills, Fuels, *Toxicity, Mortality, Biological communities, Aquatic populations, *Marine animals, *Invertebrates, *Littoral, *Salt marshes, Beaches, Plant populations, *Rhizomes, Intertidal areas, Aquatic algae, Barges, Organic compounds, Water pollution effects, Path of pollutants, Massachusetts, *Buzzards Bay(Mass), Cape Cod Canal, No. 2 Fuel oil.

On October 9, 1974 the oil barge Bouchard 65 loaded with 73,000 barrels of oil spilled an undetermined amount of No. 2 fuel oil off the west entrance of the Cape Cod Canal in Buzzards Bay Massachusetts. Qualitative samples of dead and moribund marine invertebrates were collected in tide pools and slight depressions along the beaches. A collection consisting of 4360 invertebrates comprising 105 species, plus 2 species of fish were found in 8 samples. Noticeable effects of the oil on the salt-marsh plant community were also observed. A detailed quantitative examination was begun to determine the effects of the oil on various components of the affected salt-marsh community in Winsor Cove compared to a selected control site. Examination of the interstitial fauna found in the study area in the summer of 1977 showed an extremely reduced number of individuals and species. (EIS-Deal)
W78-09274

LONG-TERM EFFECTS OF AN OIL SPILL ON FUCUS MACROFAUNA IN A SMALL BALTIC BAY,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
M. Notini.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 745-753, 1978. 7 fig, 1 tab, 21 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Biological communities, Fuels, *Littoral, *Amphipoda, *Mollusks, *Gastropods, Aquatic populations, *Isopods, *Toxicity, Mortality, Organic compounds, Water pollution effects, Seasonal, Crustaceans, Oil tanker, Fucus, Sweden, *Stockholm archipelago.

On October 6, 1970, the small tanker, Irini ran aground in the southern part of the Stockholm archipelago, releasing about 1000 t of medium and heavy fuel oil. Approximately 400 t drifted into a small bay wiping out nearly the entire littoral fauna. Most of the oil was collected mechanically during the winter, and by May 1971 cleanup operations were completed. The recruitment of the bladder wreck (Fucus vesiculosus) community in the bay was observed at intervals over a 5-year period. Significantly increased macrofauna population densities were found for a number of species in the 1974 and 1976 samples compared to those of 1971 and 1972. Larvae of Chironomidae were the only group found with a decreased density between the first and sixth summers after the spill. The data are discussed in relation to conditions in a nearby unpolluted bay and to normally occurring cyclic variations. (EIS-Deal)
W78-09275

OBSERVATION OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTENT OIL SPILL FROM THE GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
R. C. Clark, Jr., B. G. Patten, and E. E. DeNike.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 754-765, 1978. 9 fig, 2 tab, 18 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Fuels, Intertidal areas, Biological communities, Animal populations, Plant populations, *Aquatic populations, *Toxicity, Mortality, *Algae, *Absorption, Beaches, Organic compounds, *Ecology, Ecosystems, Water pollution effects, Tar, Urchins, Paraffinic hydrocarbons.

A rich and productive intertidal community was exposed continually for over 5 yr to small quantities of a Navy Special fuel oil from the unmanned troopship General M.C. Meigs that came aground on the Washington coast in January 1972. Observations of animal and plant populations and their petroleum hydrocarbon uptake patterns showed early evidence of contamination and the persistence of the oil spill throughout the study period. Abnormal and dead urchins, and loss of algal fronds and pigment were observed in localized areas near the wreck for at least 1 yr. Within 2 mo of the accident, paraffinic hydrocarbons had been taken up by prominent members of the community and continued to appear in certain species even after 5 yr. Although changes were seen in certain species during the early days of this persistent low-level pollution incident, the community balance in the rocky, intertidal ecosystem does not appear to have been markedly altered. (EIS-Deal)
W78-09276

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
E. J. Leppakoski, and L. S. Lindstrom.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 766-775, 1978. 10 fig. 3 tab, 40 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Industrial wastes, Waste water(Pollution), Oil industry, *Oil wastes, *Benthic fauna, Waste water treatment, *Larval growth stage, *Sediments, *Oligochaetes, *Toxicity, Mortality, Path of pollutants, Water pollution effects, Shannon Diversity Index, Recolonization, Polychaetes, Bivalves.

Quantitative field studies (density, wet weight biomass, Shannon diversity, species richness, evenness of distribution) on benthic sublittoral macrofauna were made in the vicinity of an oil refinery in southwest Finland before and after the installation of a new wastewater treatment plant that reduced the amount of oil and liquid effluents by ca. 90-95%. The number of species and species diversity increased during the 1st and 2nd yr after pollution abatement at the stations close to the former outflows. Details of postabatement succession are discussed. The results demonstrate not only the recovery from chronic oil pollution but also the degree of ecological damage caused by previous continuous discharge of oil. (EIS-Deal)
W78-09277

RECRUITMENT OF BENTHIC ANIMALS AS A FUNCTION OF PETROLEUM HYDROCARBON CONCENTRATIONS IN THE SEDIMENT,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
J. W. Anderson, R. G. Riley, and R. M. Bean.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 776-790, 1978. 11 fig, 4 tab, 21 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, Sediments, *Bottom sediments, Intertidal areas, *Benthic fauna, *Gas chromatography, *Biodegradation, *Annelids, *Mollusks, *Crustaceans, Organic compounds, Chemical analysis, Path of pollutants, Depuration, *Crude oil.

Three separate field installations, consisting of clean and oiled sediment in fiberglass trays, were placed in the intertidal zone to determine rates of hydrocarbon depuration and recruitment of benthic organisms. Detailed chemical analysis, with glass capillary gas chromatography and gas-chromatography-mass spectroscopy, were conducted such that individual compounds and hydrocarbon classes associated with the sediment after varying periods of field depuration could be quantitated. Depuration rates of hydrocarbon types in sediment receiving oil on the surface (installations I and II) decreased in the order of saturates, methylnaphthalenes, and methylphenanthrenes. Rates of specific compound and hydrocarbon class depuration followed the general pattern exhibited by total hydrocarbons. These results are discussed in relation to physical and chemical processes acting on the oil-contaminated sediments. (EIS-Deal)
W78-09278

BENTHIC HYDROCARBONS OF RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-09279

PERSISTENCE OF POLYCHLORINATED BIPHENYLS IN MARINE BIVALVES,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-09280

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLOFJORD,
N. Klavestad.
Botanica Marina, Vol. 21, p 71-97, 1978. 7 fig, 9 tab, 44 ref.

Descriptors: *Benthic flora, *Aquatic algae, *Vegetation, *Surveys, *Algae, Seasonal, Annual, *Salinity, *Water temperature, Currents(Water), *Distribution patterns, Spatial distribution, Ecological distribution, Dominant organisms, Biological communities, On-site data collections, Ecology, Ecosystems, Population.

The benthic algal vegetation of the inner, polluted part of the Oslofjord was investigated during the period 1962-66. Observations were made at 101 localities. The area was divided into four sub-areas, each with its characteristics floristic features. A brief general description of the vegetation of the different sub-areas is given. The Oslofjord has previously been subjected to algological investigations, and the results of the preent survey are compared with their results. The survey contains decriptions of seasonal and annual variations in the vegetation throughout the whole area. On the basis of the available data on salinity, temperature, currents, pollution, and other ecological factors, the distribution of the various algae are discussed. Finally, there is a floristic list with information on life cycles stages of the various species. (EIS-Deal)
W78-09281

DISEASES, PARASITES, AND TOXIC RESPONSES OF COMMERCIAL PENAEID SHRIMPS OF THE GULF OF MEXICO AND SOUTH ATLANTIC COASTS OF NORTH AMERICA,
Environmental Research Lab., Gulf Breeze, FL.
J. A. Couch.
Fishery Bulletin, Vol. 76, No. 1, p 1-44, 1978. 46 fig, 4 tab, 85 ref.

Descriptors: *Shrimp, Commercial shellfish, Diseases, Animal pathology, Infection, *Parasitism, *Viruses, *Pathogenic fungi, *Bacteria, *Nematodes, *Heavy metals, *Pesticides, *Cadmium, *Mercury, Water pollution effects, Path of pollutants, *Helminthes, *Tumors, Gas bubble disease.

A reference work and review of both infectious and noninfectious diseases of commercial penaeid shrimps of the Gulf of South Atlantic region of the United States is presented. Disease is second only to predation and periodic physical catastrophes in limiting numbers of penaeid shrimps in nature and second only to nutritional and reproductive requirements in limiting aquacultural successes with penaeid shrimps. Noninfectious disease agents in penaeid shrimps are chemical pollutants, heavy metals, and environmental stresses. Organochlorine, organophosphate, and carbamate peasticides all have adverse effects in penaeids. Fractions of petroleum, particularly the naphthalenes, are very toxic to shrimp. Little other work has been done on the effects of petroleum on penaeid shrimps. Cadmium causes black gills in shrimp by killing gill cells. Mercury is accumulated by penaeids and may interfere with their osmoregulatory abilities. Many chemotherapeutic chemicals used routinely in treatment of fish diseases are toxic to shrimp at certain determined concentrations. Spontaneous pathoses found are a benign tumor, muscle necrosis, and gas bubble disease. 'Shell disease' is discussed from points of view of possible causes. A syndrome of 'broken backs' is reported in penaeid shrimps for the first time. An overview is presented for general needs in penaeid shrimp health research. (EIS-Deal)
W78-09282

UPPER TEMPERATURE TOLERANCES OF TELLINA TENUIS AND T. FABULA,
Glasgow Univ. (England). Dept. of Zoology.
J. G. Wilson.
Marine Biology, Vol. 45, p 123-128, 1978. 4 fig, 4 tab, 30 ref.

Descriptors: Temperature, *Water temperature, *Thermal properties, *Heat resistance, Mortality, *Mollusks, *Larval growth stage, *Lethal limit, Animal metabolism, Animal physiology, *Ecological distribution, Life cycles, Littoral, Acclimation, *Tellina.

The upper lethal tolerances of these two species were studied under a variety of temperature regimes in which both short-term and long-term mortality were noted. These included steady temperatures, acclimation at a steady temperature then exposure to a steady temperature, and acclimation at gradually increasing temperatures. T. tenuis was also tested for variation in mortality rate according to the date of collection or to the size (i.e, age) of the mollusc. The results suggested that T. tenuis was consistently more tolerant than T. fabula, and that the difference in tolerance was around 5C. Both species readily acclimated to higher temperatures after steady temperature acclimation, but not under a regime of gradually increasing temperature. There was no significant variation in the mortality rate of T. tenuis with season or age. It is suggested that, since the difference in temperature tolerance is not reflected in their respective geographical distributions, there may be some other stage in their life cycle, e.g. the larvae, which is equally susceptible to temperature extremes. The difference in tolerance, is, however, reflected in their respective littoral and sublittoral distributions. (EIS-Deal)
W78-09283

EFFECT OF PENTACHLOROPHENOL (PCP) ON MEIOBENTHIC COMMUNITIES ESTABLISHED IN AN EXPERIMENTAL SYSTEM,
University of West Florida, Pensacola. Faculty of Biology.
F. R. Cantelmo, and K. R. Rao.
Marine Biology, Vol. 46, p 17-22, 1978. 2 fig, 3 tab, 34 ref.

Descriptors: *Nematodes, Soil microorganisms, *Pest control, *Biomass, Food habits, Animal behavior, *Sediments, Biological communities, Estuarine environment, Predation, *Pesticides, Water pollution effects, Aquaria, Algicides, Microorganisms, Estuaries, *Phenols, Biocide, Epistrate feeders, *Pentachlorophenol.

Aquaria containing clean sand received a continuous supply of seawater from Santa Rosa Sound, Florida, USA, mixed with known concentrations (7, 76, 622 micrograms l-1) of pentachlorophenol (PCP). After 9 weeks, nematodes accounted for 87% of the total meiofauna. Nematode biomass and densities were greatest in aquaria exposed to 76 micrograms PCP l-1 and were least in aquaria exposed to 622 micrograms PCP l-1. Epistrate feeders were abundant in control aquaria and aquaria exposed to 7 and 76 micrograms PCP l-1, but not in aquaria exposed to 622 micrograms PCP l-1. Selective deposit feeders were not abundant in the control aquaria and aquaria exposed to 7 micrograms PCP l-1, but comprised 19% of the nematodes in aquaria exposed to 76 micrograms PCP l-1 and 61% in aquaria exposed to 622 micrograms PCP l-1. The marked reduction in benthic algae in high PCP aquaria probably was responsible for the decrease in epistrate feeders due to diminished food supply. (EIS-Deal)
W78-09284

EFFECTS OF THE ORGANOPHOSPHORUS INSECTICIDES TEMEPHOS (ABATE) AND CHLORPYRIFOS (DURSBAN) ON POPULATIONS OF THE SALT-MARSHES MELAMPUS BIDENTATUS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
G. Fitzpatrick, and D. J. Sutherland.
Marine Biology, Vol. 46, p 23-28, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Insecticides, *Organophosphorus pesticides, *Pesticide toxicity, Pest control, Spraying, *Insect control, *Larvicides, Growth stages, Snails, *Biological communities, Mosquitoes, Population, New Jersey, Salt marshes, *Temephos, Chlorpyrifos, *Melampus.

The two toxicants were aerially applied to mosquito breeding areas in New Jersey salt marshes in the manner normally used in biting-fly control operations. No significant change in the population density of M. bidentatus was observed in response to multiple treatments of granular formulations of either temephos or chlorpyrifos. However, there was a highly significant (P less than 0.01) depression in population density observed in the plot exposed to multiple treatments of a temephos emulsion. This depression was followed by a resurgence in density levels, beginning 3 weeks after the last treatment. The specific mechanism for this perturbation is not known. However, it is hypothesized that it might involve some combination of indirect insecticide effects coupled with age-specific effects. Tests of age structure of the affected population using the chisquare distribution supported this hypothesis. (EIS-Deal)
W78-09285

MODIFICATIONS OF CONTINUOUS-FLOW TOXICITY TEST METHODS FOR SMALL AQUATIC ORGANISMS,
Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center.
For primary bibliographic entry see Field 5A.
W78-09286

RATIONAL DESIGN OF HATCHERIES FOR INTENSIVE SALMONID CULTURE, BASED ON METABOLIC CHARACTERISTICS,
Michigan Dept. of Natural Resources, Lansing.
H. Westers, and K. M. Pratt.
The Progressive Fish Culturist, Vol. 39, No. 4, p 157-165, October 1977. 2 tab, 7 fig, 21 ref.

Descriptors: Fish physiology, *Aquiculture, *Salmonids, *Fish management, *Metabolism, Design, Environmental effects, Water quality, *Design criteria, *Ammonia, *Carrying capacity, Fish farming, Commercial fish, Aquatic productivity, Fish hatcheries, Productivity, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Salmonid culture, Water exchange rate, Rearing ponds.

Design criteria for a new hatcheries for the intensive culture of fish should be based on a correlation of water quality characteristics with data on fish metabolism. This paper presents much of the available information on water quality (pH, temperature, dissolved oxygen, and un-ionized ammonia), water exchange rates, and fish metabolism, and suggests appropriate management practices and design criteria that take these factors into account. Specific recommendations include a water exchange rate of four per hour, dissolved oxygen saturation of 90% in incoming water and not less than 5 mg/l in effluent water, and a maximum allowable concentration of 0.0125 mg/l of un-ionized ammonia. (EIS-Katz)
W78-09287

DINOFLAGELLATE TOXINS AS PROBABLE CAUSE OF AN ATLANTIC HERRING (CLUPEA HARENGUS HARENGUS) KILL, AND PTEROPODS AS APPARENT VECTOR,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5B.
W78-09288

POPULATION DYNAMICS OF DAPHNIA GALEATA MENDOTAE AS MODIFIED BY CHRONIC CADMIUM STRESS,
J. S. Marshall.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 461-469, 1978. 4 fig, 4 tab, 31 ref.

Descriptors: *Cadmium, *Daphnia, Biological communities, *Population, *Zooplankton, *Toxicity, Mortality, *Reproduction, *Fertility, *Growth stages, *Growth rates, *Biomass, *Embryological growth stage, *Great Lakes, *Lake Michigan, *Carrying capacity, *Path of pollutants, Water pollution effects, Heavy metals, Extinction.

Forty populations of Daphnia galeata mendotae were maintained for 22 wk (or until they became extinct) in a medium consisting of filtered Lake Michigan water to which Chlamydomonas reinhardi and different concentrations of a mixture labelled (109Cd) plus stable CdCl2 were added 24 h before use. Weekly determinations were made of total numbers, average individual dry weight, mean brood size, egg-female ration aborted eggs and embryos, and average whole-body 109Cd content. Chronic cadmium stress reduced the populations' average numbers and biomass, while it increased the populations' turnover rates, temporal variability, probability of extinction, and proportion of ovigerous females. For individuals there was increased brood size. Due to compensatory increases in the proportion of ovigerous females and brood size mean, the cadmium sensitivity of population attributes was considerably less than that of the most sensitive individual attribute, prenatal mortality. A linear relationship between population carrying capacity (relative mean numbers) and added cadmium concentration indicated that the effective concentration for a 50% reduction of carrying capacity (EC50) is 7.7 micrograms Cd/l and that for a 1% reduction (EC1) is 0.15 micrograms Cd/l. (EIS-Deal)
W78-09289

EFFECTS OF THERMAL EFFLUENT ON STANDING CROP AND NET PRODUCTION OF ELODEA CANADENSIS AND OTHER SUBMERGED MACROPHYTES IN LAKE WABAMUN, ALBERTA,
Alberta Univ., Edmonton. Dept. of Botany.
R. W. Haag, and P. R. Gorham.
Journal of Applied Ecology, Vol 14, p 835-851, 1977. 7 fig, 1 tab, 31 ref.

Descriptors: *Thermal pollution, *Heated water, Water temperature, Thermal stratification, Cooling water, *Productivity, Seasonal, Standing crops, *Plant populations, Aquatic populations, Dominant organisms, Water pollution effect, Effluents, Population, *Macrophytes, *Elodea, Diversity.

The dry matter production of aquatic macrophytes was measured over 2 years, at three depths, in Lake Wabamun, Alberta, Canada. Production was measured in an area receiving thermal effluent and at a control site, unaffected by thermal effluent. A greater standing crop existed in winter in the thermal mixing zone. Elodea canadensis, which had no marked dormancy mechanism, was dominant in this zone in winter. Higher light levels, due to the absence of ice over, resulted in earlier spring growth in the effluent zone, but early spring productivity was limited by low water temperatures, caused by strong thermal stratification. Elodea dominated early spring production because of the large standing crop overwinter. Changes in the species composition of submerged macrophytes in heated areas of Lake Wabamun do not seem to have spread to unheated acres of the lake. (EIS-Deal)
W78-09290

BIOCIDES IN RELATION TO WATER POLLUTION PART I: BIOASSAY STUDIES ON THE EFFECTS OF A FEW BIOCIDES ON FRESH WATER FISH, CHANNA GACHUA,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
R. C. Dalela, S. R. Verma, and M. C. Bhatnagar.
Acta Hydrochimica et hydrobiologica, Vol 6, No 1, p 15-25, 1978. 3 tab, 35 ref.

Descriptors: *Toxicity, *Lethal limit, *Pesticides, *Bioassay, *Endrin, *Water temperature, *Hydrogen ion concentration, Fish behavior, Laboratory tests, Freshwater fish, Chlorinated hydrocarbon pesticides, Environmental effects, Size, Mortality, Organophosphorus pesticides, *Channa, *Malathion, *Phosvel, *Thiodon.

In static tests, the LC50 for Channa gachua is determined for 24, 48, 72 and 96 hours for the following insecticides (results in mg/l): Endrin (0.007), Thiodon (0.01), Malathion (8), Phosvel (32). The toxicity of the four insecticides decreases with dropping temperature (35 and 24C), increasing pH value (pH 7.5 and 8.4) and increasing fish size (110 and 140 mm length). The safe concentration of the four insecticides in water is determined as follows: 0.002 mg/l Endrin, 0.003 mg/l Thiodon, 1.9 mg/l Malathion, and 9.2 mg/l Phosvel. (EIS-Katz)
W78-09293

THE EFFECTS OF CRUDE EKOFISK OIL AND OIL PRODUCTS ON MARINE FISH LARVAE,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
S. Lonning.
Astarte, Vol 10, p 37-47, 1977. 7 fig, 2 tab, 23 ref.

Descriptors: *Oil, *Larvae, Larval growth stage, Water pollution effects, *Bioassay, Commercial fish, Fish reproduction, *Toxicity, Mortality, *Fish eggs, *Embryonic growth stage, Pathology, Water pollution sources, Oil wastes, Oil pollution, Pollutants, Environmental effects, Microscopy, Morbidity, Fish physiology, Pleuronectes, Gadus, Platichthys, Ekofisk Oil.

Larvae of three species of marine teleosts were used in a study of the effects of crude Ekofisk oil, Ekofisk fractions, and some low boiling aromatics. Crude Ekofisk oil suspensions or extracts of oil had a moderate effect during early development, but during organogenesis the following effects were observed: Poor differentiation of the head region, protruding eye lenses, abnormally bent notochord, various levels of inhibition of hatching and breakdown of yolk. Similar effects were observed after treatment with the high boiling point samples, wheras the low boiling point samples caused a high incidence of rapid cytolysis and often delay and irregularities in cleavage and development. (EIS-Katz)
W78-09294

COMPARATIVE METABOLISM OF PCB ISOMERS BY THREE SPECIES OF FISH AND THE RAT,
Wisconsin Univ., Madison. Dept. of Entomology.
R. Hinz, and F. Matsumura.
Bulletin of Environmental Contamination and Toxicology Vol 18 No 5, p 631-639, 1977. 3 fig, 3 tab, 8 ref.

Descriptors: Fish physiology, *Metabolism, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Halogenated pesticides, *Rainbow trout, Chemical reactions, *Bullheads, *Catfishes, Tracers, *Radioactivity techniques, *Chromatography, Animal physiology, Metabolism, Path of pollutants, Chemical analysis, Aroclor, Rat, Goldfish.

The ability to metabolize radioactively-labeled trichlorobiphenyl was analyzed in the goldfish, bullhead, rainbow trout, and the rat. Polar metabolities were observed in the livers of all species, but there was considerable inter- and intraspecific variation in quantity of metabolites present. Thin-layer chromatography suggested a similarity in the pattern of PCB metabolisms in the goldfish and rat. The authors regarded the goldfish as a good species for studying fish metabolism. (EIS-Deal)
W78-09295

SUBLETHAL EFFECTS OF INSECT GROWTH REGULATORS UPON CRAB LARVAL BEHAVIOR,
Duke Univ., Beaufort, NC. Marine Lab.
R. B. Forward, Jr., and J. D. Costlow, Jr.
Water, Air, and Soil Pollution, Vol 9, p 227-238, 1978. 6 tab, 32 ref.

Descriptors: *Toxicity, *Crabs, Animal behavior, Animal physiology, Animal metabolism, *Growth rates, *Growth stages, *Larval growth stage, *Insecticides, *Insect control, *Enzymes, Crustaceans, Water pollution effects, Mosquitoes, Salinity, Water temperature, Phototaxis, Zoeae, *Growth regulators(Insects), Methroprene, Hydroprene, Dimiline.

Both swimming speeds and phototaxis by the four larval stages of the crab Rhithropanopeus harrisii were monitored upon chronic exposure to sublethal concentrations of the insect growth regulators methroprene, hydroprene, and dimiline. Larvae were reared under conditions of salinity (20 o/oo) and temperature (25C) which produce the greatest developmental success. Sublethal concentrations of methroprene had no effect on swimming rates or phototaxis as compared to the acetone control larvae. For hydroprene, swimming rates by stage I, II, and III zoeae were unaffected while a significant increase in swimming speeds occurred in stage IV zoeae exposed to concentrations of 0.05 and 0.1 ppm. Only stage III zoeae exposed to 0.1 ppm showed a significant decrease in the level of positive phototaxis. Dimilin was much more potent, as significant increases in swimming speeds occurred in Stage I, II, and III zoeae, with 0.3 ppb being the lowest effective concentration. Although swimming by Stage IV zoeae was unaffected, phototaxis was altered at concentrations as low as 0.1 ppb. Concentrations normally used to control mosquito larvae were found to alter behavior. (EIS-Deal)
W78-09296

PHOTOSYNTHESIS/RESPIRATION RATIOS IN AQUATIC MICROCOSMS UNDER ARSENIC STRESS,
Oak Ridge National Lab., TN.
J. Giddings, and G. K. Eddlemon.
Water, Air, and Soil Pollution, Vol 9, p 207-212, 1978. 2 fig, 17 ref.

Descriptors: *Arsenic, *Toxicity, *Photosynthesis, *Photosynthetic oxygen, Biological communities, *Dissolved oxygen, *Primary productivity, *Respiration, *Arsenic compounds, *Sodium compounds, *Mathematical studies, Ecosystems, Water pollution effects, Monitoring, Microorganisms, *Photosynthesis/Respiration ratios.

The ratio of net photosynthesis (P) to total ecosystem respiration (R) usually declines when an aquatic ecosystem is subjected to various types of stress. P/R ratios were measured in 12 80-l microcosms containing water, sediment, and entire biotic communities from a shallow pond. P and R were estimated from changes in dissolved 02 concentrations during the day and night, respectively. After 10 weeks, the microcosms were stressed by the addition of sodium arsenate at concentrations of 0, 0.066, 11.5, and 143 ppm (as As). P/R ranged from 1.0 to 1.4 in all microcosms before arsenate was added. Under stress, both P and R declined in the 11.5 and 143 ppm microcosms, with negative net photosynthesis (i.e., decreases in

dissolved 02 during the day) observed on several occasions. P/R in these microcosms fell to zero or below, returning to 1.0 after three weeks. P/R remained above 1.0 in the 0.066 ppm and control microcosms. The P/R response could be used for screening suspected hazardous substances in microcosms, as well as for monitoring natural ecosystems. (EIS-Deal)
W78-09297

EFFECTS OF NO. 2 FUEL OIL WATER-SOLUBLE-FRACTIONS ON GROWTH AND REPRODUCTION IN NEANTHES ARENACEODENTATA (POLYCHAETA: ANNELIDA),
Texas A and M Univ., College Station. Dept. of Biology.
S. S. Rossi, and J. W. Anderson.
Water, Air, and Soil Pollution, Vol 9, p 155-170, 1978. 7 fig, 2 tab, 46 ref.

Descriptors: *Reproduction, *Growth rates, Growth stages, *Oil spills, *Oil pollution, *Aromatic compounds, Animal growth, *Larval growth stage, *Fecundity, *Fertility, *Toxicity, Mortality, *Juvenile growth stage, *Annelids, Organic compounds, Oil, Fuels, Water pollution effects, *Water soluble fractions, *Polychaetes, *Neanthes, Tissue analysis.

Effects of water-soluble-fractions (WSFs) from No. 2 Fuel Oil on growth and reproduction were studied in experiments simulating conditions of acute and chronic sublethal exposure. Effects were defined relative to concentrations of diaromatic hydrocarbons (naphthalenes) and total dissolved hydrocarbons. Hatching of metatrochophore larvae was inversely related to WSF concentration and to the length of time larvae were exposed prior to hatching. Growth of larvae into juveniles was unaffected by low concentrations. Inhibition of larval growth by higher WSF concentrations was reversible upon return of larvae to hydrocarbon-free sea water. Growth of juveniles into adult polychaetes was inversely related to concentration. All concentrations suppressed fecundity in each generation. (EIS-Deal)
W78-09298

ACUTE EFFECTS OF WOOD-PULP ON SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
A. E. Werner, and J. Robinson.
Water, Air, and Soil Pollution, Vol 9, p 69-81, 1978. 3 fig, 4 tab, 22 ref.

Descriptors: *Toxicity, Mortality, Fish physiology, Animal metabolism, Industrial wastes, *Pulp wastes, Pulp and paper industry, *Chemical wastes, *Cellulose, *Sockeye salmon, *Wood wastes, *Bioassay, Fish behavior, Water pollution effects, Water quality standards, Effluents, *Sublethal effects, Cellulose fiber, Wood fiber.

Freshwater suspensions of pulp fiber in concentrations exceeding 1000 ppm at 15C are acutely lethal to sockeye salmon fingerlings. Limited adaptation of such fish to fiber is possible but injury, at least in the short term, is irreversible. The acute lethality of various toxicants associated with industrial pulps is synergistically enhanced by the presence of fiber. Pulp storage up to 158 days at 15C had no significant effect on the acute lethality. Highly purified fibers are less toxic in freshwater than in sea water. The sensitivity to fiber of fish from two sources did not differ significantly. (EIS-Deal)
W78-09299

CONCENTRATION OF THREE METALS IN OYSTERS (CRASSOSTREA VIRGINICA) OF BILOXI AND PASCAGOULA, MISSISSIPPI ESTUARIES,
Jackson State Coll., MS. Dept. of Biology.
E. J. Harvey, Sr., and L. A. Knight, Jr.
Water, Air, and Soil Pollution, Vol. 9, p 255-261, 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Heavy metals, *Mercury, *Lead, *Cadmium, Commercial shellfish, *Oysters, *Poisons, *Spectrophotometry, *Trace elements, *Food chains, Metals, Path of pollutants, Chemical analysis, Chelation, *Mississippi, Tissue analysis, Bioaccumulation.

Concentrations of three toxic trace metals, Hg, Pb, and Cd in the commercial oyster Crassostrea virginica were measured by atomic absorption spectrophotometry. Mercury concentrations were low and appeared to be natural background levels. Lead content of the Mississippi oysters compared favorably with levels in Atlantic Coast oysters, but Cd in Atlantic Coast oysters was approximately 6.7 times greater than in the local specimens. There was no definite relation between oyster size and Pb, Hg, or Ce content. (EIS-Deal)
W78-09300

5D. Waste Treatment Processes

ULLSWATER INSTALLATION.
Effluent and Water Treatment Journal, Vol. 18, No. 3, p 105, March, 1978.

Descriptors: *Treatment facilities, *Biological treatment, *Resins, *Construction materials, *Rural areas, Design data, Septic tanks, Sewage treatment, Recreational facilities, Sewage disposal, Waste water treatment, Domestic wastes.

A Klargester BioDisc waste water treatment plant with a daily capacity of 10.8 cu m has been installed at the Helvellyn youth hostel in Ullswater, England. The 5.4 by 2.7 m BioDisc has a height of 3.2 m, of which 0.5 m is visible above ground. The Cellobond glass-reinforced polyester resin unit weighs 2.8 tons and is suitable for remote locations, such as the youth hostel which is 1,100 ft up the Helvellyn mountain. The BioDisc sewage treatment plant was installed within 30 min and tripled the sewage treatment capacity of the hostel. The sewage treatment plant can handle waste water with organic loads up to 4.08 kg/day BOD. (Lisk-FIRL)
W78-08838

PACKAGED SEWAGE TREATMENT PLANT.
Surveyor, Vol 151 No 4447, p 27, March, 1978.

Descriptors: *Biological treatment, *Filtration, *Domestic wastes, *Nutrient removal, *Porous media, Tertiary treatment, Fabrics, Sewage sludge, Equipment, Biochemical oxygen demand, Suspended solids, Waste water treatment, Municipal wastes.

G. F. Dickson Environmental Engineering Ltd. of Guilford, Surrey, England, has developed the Biospiral immersed rotating disc biological filtration system suitable for populations of 10-800. The compact unit contains an archimedian screw biological filter and a drum filter for suspended solids removal. The Biospiral system continuously recycles sludge and liquor to produce an effluent with 20/30 BOD and suspended solids concentrations. The patented tertiary treatment system employing a cloth filter is automatically cleaned when solids accumulate, eliminating the need for clarification of the effluent. Filter cleaning pumps transport the solids removed from the filter effluent. Filter cleaning pumps transport the solids removed from the filter cloth surfaces to the system inlet or sludge storage tanks. The Biospiral units may be installed in series as part of a larger treatment system. The unit can accomodate fluctuating loads and has low operating and maintenance requirements. (Lisk-FIRL)
W78-08860

LIQUID ALUM IS SUCCESSFUL IN ORLANDO, FLA.
Water and Wastes Engineering, Vol. 15, No. 4, p 54, April, 1978.

Descriptors: *Coagulation, *Polymers, *Flocculation, *Chemical precipitation, *Trickling filters, Biochemical oxygen demand, Suspended solids, Nutrient removal, Porous media, Waste water treatment, Municipal wastes.

Orlando, Florida's, Bennett Road waste treatment plant removes 90% of the BOD and suspended solids from 10 mgd of waste water with liquid alum treatment. The trickling filter facility has a design capacity of 8 mgd; an average of 150-200 ppm of liquid alum is added to the waste water just prior to secondary clarification. The plant stores the 2.5-3 weekly truckloads of alum delivered in two 7,000 gal tanks; one tank holds a three-day reserve. During daly periods of high waste water flow, alum is added to the splitter box effluent after trickling filtration to provide additional flocculation time. Polymers are added before the secondary clarifier to assist in coagulation. The effluent BOD and suspended solids concentrations, after alum treatment, are 13 and 20 ppm, respectively. Effluent samples are analyzed every 2 hrs. At 24 mgd advanced treatment facility planned for Orlando will also be disigned to incorporate the liquid alum treatment. (Lisk-FIRL)
W78-08877

CANADIAN GOVERNMENT APPROVES $66 MILLION LOANS TO MONTREAL FOR SEWAGE TREATMENT PROJECT.
Water and Pollution Control, Vol 116, No 1, p 17, January, 1978.

Descriptors: *Treatment facilities, *Legislation, *Construction, *Tunnels, *Sewerage, Collector sewers, Tunnel construction, Transport, Waste water treatment, Municipal wastes.

The Canadian government, through the Central Mortgage and Housing Corp., has loaned the Montreal Urban Community $66,660,400 for improvement of its municipal sewage collection and treatment system. Twenty-five percent of this loan, or $16,665,100, does not have to be repaid by Montreal. The loan is part of the $1.2 billion required for the upgrading of Montreal's sewerage system. Two-thirds of the total funding will be furnished by the Central Mortgage and Housing Corp. Loans totalling more than $231 million have been awarded to the Montreal Urban Community since 1974. The most recent loan will be used to purchase the land for a waste water treatment plant and for awarding contracts for its construction. Of the total cost of the project, $22 million was for the construction of an 11-ft diameter sewage collector tunnel. The Canadian government has awarded more than $1.5 billion to over 3,700 projects; 700 projects in Quebec have received $356 million, of which $67 million does not have to be repaid. (Lisk-FIRL)
W78-08883

MEDIATION OF ACID STRIP MINE POLLUTION BY THE ATTEMPTED INHIBITION OF THE IRON-OXIDIZING AUTOTROPH, THIOBACILLUS FERROOXIDANS,
Pennsylvania State Univ., University Park.
M. A. Kugatow.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 7803339. PhD Thesis, 1977. 68 p.

Descriptors: *Thiobacillus ferrooxidans, *Acidic soils, *Acid mine water, *Iron bacteria, *Sulfur bacteria, Strip mines, Neutralization, Acid bacteria, Soil bacteria, Detergents, Mine wastes, Inhibitors, Inhibition, On-site investigations, Laboratory tests, Industrial wastes.

The growth of autotrophic Thiobacillus ferrooxidans, sulfur-oxidizing bacteria, and heterotrophic microorganisms in strip-mined acid soils and in laboratory test soil was studied under varying conditions of pH, chemical treatment, and detergent inhibitors. Soils with low pH values contained high concentrations of the iron-oxidizing bacteria; partial neutralization of the acid solids reduced the iron-oxidizing bacterial population. Sulfur oxidizing bacterial growth was not related to pH, although partial neutralization of the soils with Ca(OH)2 stimulated microogranism growth in some instances. Dodecylbenzenesulfonate detergent applied to the soils decreased the population of iron-oxidizing bacteria for 2-6 weeks except in highly acidic soils; sulfur-oxidizing bacterial numbers fluctuated but were not significantly affected by the detergent. Laboratory soil tests verified the data from on-site investigations; detergent hindered the growth of Thiobacillus ferrooxidans and prevented the reacidification of some partically neutralized mine soils. The inhibitors utilized in these tests did not change pH or total acidity of the acid mine soils. (Lisk-FIRL)
W78-08885

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME III. PROCESSING SYSTEMS TECHNICAL ANALYSES.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 915, Price codes: A24 in paper copy, A01 in microfiche. Report to NOAA, Office of Marine Minerals, August 1977. 559 p, 134 ref. Contract 6-35331.

Descriptors: Water pollution effects, *Manganese, Resources development, *Waste disposal, Mining, Environmental effects, *Waste treatment, *Outer Continental Shelf, *Underwater mining, *Nodules(Manganese).

This report brings together technological information pertinent to the processing of manganese nodules mined from the sea floor and to help access the effects of manganese nodule processing activities on land and marine environments. It treats potential methods, operations, and requirements for processing and handling manganese nodules on land and at sea, including recovery of value metals; transport of manganese-nodule ore and process wastes, treatment and disposal of wastes, material and energy balances and resource requirements. This volume contains description of alternatives for an on-shore processing of manganese nodules; economics of nodule mining and processing; specific leach processes; at-sea processing; waste treatment; and noise assessment. (See also W78-08956)
W78-08957

STATISTICAL SUMMARY, 1956 INVENTORY OF MUNICIPAL WATER FACILITIES IN CITIES OVER 25,000 POPULATION.
Public Health Service, Rockville, MD.
For primary bibliographic entry see Field 5F.
W78-09061

\FT ENVIRONMENTAL IMPACT STATEMENT, ASPEN METRO SANITATION DISTRICT, SNOWMASS WATER AND SANITATION DISTRICT--201 WASTEWATER FACILITIES PLANS.
Weiner and Associates, Denver, CO.
For primary bibliographic entry see Field 6G.
W78-09066

SUMMARY: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE--JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 6G.
W78-09067

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR MARION, NORTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 6G.
W78-09068

FINAL ENVIRONMENTAL IMPACT STATEMENT - NORTH FREMONT COUNTY WASTEWATER FACILITIES.
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 6G.
W78-09073

PRODUCTION AND DYNAMICS OF SALT MARSH VEGETATION AND THE EFFECTS OF EXPERIMENTAL TREATMENT WITH SEWAGE SLUDGE: BIOMASS, PRODUCTION, AND SPECIES COMPOSITION,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-09099

ENGINEERING AND MANAGEMENT ASPECTS OF DREDGE DISPOSAL AND TREATMENT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
For primary bibliographic entry see Field 5E.
W78-09176

A REVIEW OF CONFLICT RESOLUTION MODELS IN WATER RESOURCES MANAGEMENT,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09192

5E. Ultimate Disposal Of Wastes

GEOHYDROLOGIC EVALUATION OF A LANDFILL IN A COASTAL AREA, ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08849

WATER-QUALITY CONDITIONS IN SOUTHERN ROCKINGHAM COUNTY, NEW HAMPSHIRE,
Geological Survey, Boston, MA. Water Resources Div.; and Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5B.
W78-08858

DISPOSAL IN THE MARINE ENVIRONMENT: AN OCEANOGRAPHIC ASSESSMENT.
National Research Council, Washington, DC. Ocean Disposal Study Steering Committee.
For primary bibliographic entry see Field 5G.
W78-08886

MERCURY IN SOUTHERN CALIFORNIA WATERS: INPUTS, DISTRIBUTION, AND FATE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-08888

SPREADING SLUDGE.
Surveyor, Vol. 151, No. 4469, p 22, February, 1978.

Descriptors: *Sludge disposal, *Design data, *Construction materials, *Drying, *Return flow, Sewage disposal, Baffles, Valves, Sludge treatment, Waste water treatment, Waste water disposal, Municipal wastes.

A sludge spreading tanker with a 10-ft sludge outfall capability has been ordered by the Thames Water Authority in England for the application of wastes to land. The tanker is manufactured by Fergussons (Tankers) Ltd. of Portsmouth, Hampshire, England, and equipped with an engine mounted on an M-type Bedford chassis. The spreader utilizes fan-shaped plates for even sludge application. A Metalastic bush on the front of the truck and heavy duty outriggers on the back support the 1,300 g mild-steel tank which contains dished and flanged internal anti-surge baffles to distribute the strain on the knuckled radius. The tank webs have returned edges for extra strength. Two Reis 4-inch discharge slide valves at the rear of the tanker have stainless steel blades and are air operated. (Lisk-FIRL)
W78-08951

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME II: TRANSPORTATION AND WASTE DISPOSAL SYSTEMS.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
For primary bibliographic entry see Field 5G.
W78-08956

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME III. PROCESSING SYSTEMS TECHNICAL ANALYSES.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
For primary bibliographic entry see Field 5D.
W78-08957

DISPOSAL OF VEGETATION WATER FROM OLIVE-OIL EXTRACTION PLANTS. NOTE II: INCINERATION OF VEGETATION WATER (LO SMALTIMENTO DELLE ACQUE DI VEGETAZIONE PROVENIENTI DAGEI IMPIANTI DI ESTRAZIONE DELL'OLIO. NOTA II: L'INCENERIMENTO DELLE ACQUE DI VEGETAZIONE),
Stazione Sperimentale degli Olii e dei Grassi, Milan (Italy).
A. Arpino, and C. Carola.
La Rivista Italiana Delle Sostanze Grasse, Vol. 55, p 24-28, January, 1978. 2 fig, 5 tab, 2 ref.

Descriptors: *Food processing industry, *Oily water, *Oilseed crops, *Incineration, *Fuels, Oil, Natural gas, Methane, Effluent streams, Vegetable crops, Waste water treatment, Waste water disposal, Industrial wastes.

A cost comparison of gasoil-fuel incineration with other incinerator fuel sources was conducted for the combustion-disposal of waste water from an Italian olive oil processing plant. Cost factors associated with waste water treatment and disposal in olive oil plant were reviewed for a two-year period. The plant has incinerated the waste streams with gasoil fuel since 1975. Alternative supplementary fuels investigated for incineration of the olive-crushing wastes included exhausted olive husks, methane gas, and oil. The alternative fuel sources were evaluated according to the quantity of combustion material required to provide the appropriate incineration temperature and the elec-

trical energy consumption by each fuel. A 90% fuel savings was estimated for the use of spent olive husks as incinerator fuel. The utilization of olive crushing waste water was considered as an alternative to disposal. (Lisk-FIRL)
W78-08958

DILUTION IN A VERTICAL ROUND BUOYANT JET,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 8B.
W78-09033

WATER QUALITY PROGRESS IN HOLSTON RIVER BASIN,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
For primary bibliographic entry see Field 5G.
W78-09043

ENGINEERING AND MANAGEMENT ASPECTS OF DREDGE DISPOSAL AND TREATMENT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
L. K. Wang, P. M. Terlecky, and R. P. Leonard.
Journal of Environmental Management, Vol. 5, No. 2, p181-203, April 1977. 2 fig, 4 tab, 45 ref.

Descriptors: *Water resources, *Water pollution, *Environmental control, *Waste treatment, *Dredging, *Waste disposal, Environmental engineering, Economic efficiency, Costs, Wildlife, Dikes.

Various dredge collection, treatment, containment, disposal and treatment alternatives are introduced and assessed. The dredge disposal techniques discussed herein include: open water disposal and diked disposal for creating recreational areas, wildlife enhancement areas, industrial construction sites, reinforced flood control dikes, deepwater refuge ecosystems, and restored strip-mine areas. The capabilities and cost data of various applicable processes for dredge treatment are also briefly summarized. The processes reviewed here encompass the entire spectrum of preliminary, primary, secondary and advanced waste treatment techniques. Advanced waste treatment methods are included in consideration of spoil as a manageable material. (Bell-Cornell)
W78-09176

WASTE OIL STUDY, REPORT TO THE CONGRESS,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 693, Price codes: A18 in paper copy, A01 in microfiche. April 1974. 402 p, 11 fig, 52 tab, 68 ref, 7 append.

Descriptors: *Oil wastes, *Waste disposal, *Environmental effects, *Oil pollution, *Solid wastes, *Lubricants, *Ultimate disposal, Oil, Recycling, Re-refining, Fuel oil, Land disposal, Industrial wastes, Automotive lubricants, Economics, Lead, Pollutants, Water pollution, Soil contamination, Toxicity, Waste treatment, Water pollution effects.

This comprehensive report on waste oil disposal techniques and environmental effects shows that of 2.2 billion gallons of lubricating oil sold in 1972 in the United States, half was consumed in use, discarded, or lost, and half required disposal in an environmentally acceptable manner. Some 600 million gallons of automotive crankcase oil and 400 million gallons of industrial lubricating oil made up the bulk of the waste. Such oils contain many contaminants, including oxidation products, sediment, water, and metallic particles resulting from machine wear. Automotive lubricants also contain organic and inorganic chemicals from additives and from gasoline. Lead, the principal metallic contaminant in waste automotive oils, sometimes exceeds 1% by weight. In waste oil recycling/disposal, collection of the oil is the weakest link. Current disposal methods include: (1) re-refining, (2) use as a fuel for industries and utilities, (3) road oil, (4) asphalt and as a dust palliative, (5) sanitary landfills, and (6) surreptitious dumping on land or in water. The small re-refining industry relies on a costly and antiquated technology, is very susceptible to economic fluctuations, experiences feedstock shortages, and has problems of residual waste disposal. An estimated 40% of waste oil currently collected is used as fuel. Biological studies show variable toxicity according to species, method of introducing the oil, and whether marine or freshwater. (Lynch-Wisconsin)
W78-09240

5F. Water Treatment and Quality Alteration

STATISTICAL SUMMARY, 1956 INVENTORY OF MUNICIPAL WATER FACILITIES IN CITIES OVER 25,000 POPULATION.
Public Health Service, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 750, Price codes: A05 in paper copy, A01 in microfiche. March 1958. 103 p, 17 tab.

Descriptors: *Water supply, *Water sources, *Water treatment, *Municipal water, Water softening, Water chemistry, Water demand, Water purification, Sedimentation, Coagulation, Disinfection, Water treatment plants, Water source ownership.

This publication is a statistical summary of the 1956 inventory of municipal water facilities in cities over 25,000 population. Tables include a general summary of communities, population served and ownership; water sources; general types of water treatment used and population served for both surface and groundwater supplies; more specific tables summarizing number of plants and population served by such treatment processes as disinfection, coagulation and softening, corrosion correction, taste and odor control, sedimentation, and various mixing devices, and a summary of plants and population served in regard to laboratories at plants. Two types of tables are used: 'A' tables present the totals for the U.S., Alaska and Hawaii arranged according to the city's size as shown by the 1950 census; 'B' tables present the same information in a total per state. Two mutually exclusive concepts have been introduced for purposes of this and future reports--the 'community' and the 'facility'. The former is defined as a political or geographic entity with a water supply to which a census population may be assigned; the latter is a water-producing entity serving one or a group of communities. (Zayac-NC)
W78-09061

THE HYGIENIC CHARACTERISTICS OF SEVERAL POLYMERIC COATINGS PROPOSED FOR USE IN DRINKING WATER SYSTEMS (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. N. Kupyrov, V. I. Vorobets, R. K. Gakal, and S. N. Starchenko.
Gig Sanit (3), p 96-97, 1977.

Descriptors: USSR, Water pollution, *Public health, Potable water, *Polymers coatings, Toxicity, Water quality.

A hygienic study was made of new Soviet (USSR) manufactured anticorrosion and water-insulating polymeric coatings for painting submerged electric pumps in wells of the public water system. Chronic experiments were conducted on albino rats to determine the toxic properties of the putty EP-00-10, the enamel EP-2100 and the paint KHS-720. The putty produced chemical substances on contact with water which negatively affected its quality, while water extracts from it had a toxic effect on the rats, resulting in a recommendation that the given polymeric material not be used in human water supply. The enamel and paint were cleared for use on submerged pumps.--Copyright 1978, Biological Abstracts, Inc.
W78-09196

5G. Water Quality Control

REAERATION CAPACITY OF THE ROCK RIVER BETWEEN LAKE KOSHKONONG, WISCONSIN AND ROCKTON, ILLINOIS,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-08840

CHEMICAL QUALITY OF GROUND WATER IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. P. Fogelman.
Water-Resources Investigations 77-133, February 1978. 49 p, 13 fig, 14 tab, 25 ref.

Descriptors: *Water quality, *Groundwater, *Baseline studies, *Irrigable land, *California, Water wells, Water analysis, Chemical analysis, Water table, Hydrogeology, Aquifers, Central Sacramento Valley.

The study area includes about 1,200 square miles in the central Sacramento Valley adjacent to the Sacramento River from Knights Landing to Los Molinos, Calif. With recent agricultural development in the area, additional land has been brought under irrigation from land which had been used primarily for dry farming and grazing. This report documents the chemical character of the ground water prior to water-level declines resulting from extensive pumping for irrigation or to changes caused by extensive use of imported surface water. Chemical analyses of samples from 209 wells show that most of the area is underlain by ground water of a quality suitable for most agricultural and domestic purposes. Most of the water sampled in the area has dissolved-solids concentrations ranging from 100 to 700 milligrams per liter. The general water types for the area are a calcium magnesium bicarbonate or magnesium calcium bicarbonate and there are negligible amounts of toxic trace elements. (Woodard-USGS)
W78-08841

CHEMISTRY AND BIOLOGICAL HAZARD OF A COAL ASH SEEPAGE STREAM,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-08862

EFFICACY OF COPPER SULPHATE IN THE SUPPRESSION OF APHANIZOMENON FLOS-AQUAE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Whitaker, J. Barica, H. Kling, and M. Buckley.
Environmental Pollution, Vol 15, p 185-194, 1978. 4 fig, 2 tab, 12 ref.

Descriptors: *Lakes, *Primary productivity, *Fish kill, *Eutrophication, *Sulfates, *Algal control, *Copper sulfate, Chlorophyll, Algae, Algicides, Population, Diatoms, Cyanophyta, Biomass, Mortality, Metals, Water Pollution effects, Prairie Lakes(Manitoba).

Five shallow eutrophic prairie lakes in the Erickson-Elphinstone area of Manitoba were treated with copper sulphate in order to control Aphanizomenon flos-aquae blooms and prevent summer fish kills. Copper sulphate was added at concentrations of 25 to 360 micrograms/liter Cu to lakes and 100 to 3000 micrograms/liter Cu to experimental tubes in early July when A. flow-aquae filaments were about 10 mm in length. Pretreatment chlorophyll a concentrations were 48 to 55 micrograms/liter and bloom species compositions were 90 to 98% of A. flos-aquae. Excellent algal cntrol was achieved at all treatment concentrations. Typically chlorophyl a declined to 2 to 4 micrograms/liter after 4 days and A. flos-aquae completely disappeared. Algal biomass remained low for 2 to 3 weeks and then gradually increased. Often Chlorophyta, diatoms and chrysophytes dominated the algal community for the rest of the ice-free season, although in two lakes other species of cyanophyta (Microcystis sp.) were predominant. Low concentration ranging between 25 and 40 micrograms/liter Cu proved to be effective enough in these lakes. Copper concentration in the water returned to background levels after 8 to 10 days. (EIS-Klein)
W78-08864

TOXICITY OF A MIXTURE OF METALS ON FRESHWATER ALGAE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-08868

MECHANICAL CUTTING OF SUBMERSED MACROPHYTES: IMMEDIATE EFFECTS ON LITTORAL WATER CHEMISTRY AND METABOLISM,
Wisconsin Univ.-Madison. Dept. of Botany.
S. R. Carpenter, and A. Gasith.
Water Research, Vol. 12, p 55-57, 1978. 2 fig, 1 tab, 14 ref.

Descriptors: *Pest control, *Water quality, *Metabolism, *Water chemistry, Lakes, Eutrophication, Sediments, Environmental effects, Equipment, Aquatic life, Aquatic weed control, Mechanical control, Marine plants, Littoral, *Mechanical cutting, *Macrophytes.

Immediate consequences of mechanical cutting of submersed macrophytes were found to include suspension of sediments and Aufwuchs and exudation from damaged tissues which can potentially alter water chemistry and metabolism. In the densely vegetated littoral of a shallow hardwater eutrophic lake, effects of cutting on concentration of seston, dissolved organic carbon, biological oxygen demand of dissolved organic carbon, and particulate, dissolved unreactive, and dissolved reactive phosphorus were short lived or insignificant. In shallow areas, community photosynthesis and respiration were decreased by macrophyte removal. Use of this management approach on the limited basis tested does not appear to cause substantial detriment to the littoral environment. (EIS-Klein)
W78-08875

EFFECTS OF LABORATORY PROCEDURE ON FUEL OIL TOXICITY,
Massachusetts Univ., Gloucester. Marine Station.
For primary bibliographic entry see Field 5C.
W78-08880

MARINE ECOLOGY AND OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
For primary bibliographic entry see Field 5C.
W78-08881

USE OF HYDROPONICS TO MAINTAIN QUALITY OF RECIRCULATED WATER IN A FISH CULTURE SYSTEM,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
W. M. Lewis, J. H. Yopp, H. L. Schramm, Jr., and A. M. Bradenburg.
Transactions of the American Fisheries Society, Vol 107, No 1, p 92-99, 1978. 2 fig, 3 tab, 13 ref.

Descriptors: *Hydroponics, *Aquiculture, *Catfishes, *Channel catfish, Recirculated water, *Filters, *Tomatoes, *Nutrients, *Water reuse, *Dissolved oxygen, *Growth rates, *Water circulation, *Plant growth, Waste water disposal, *Biofiltration.

Fish production, biofiltration, and hydroponics were linked in a closet of recirculating water. Fish tanks were stocked with channel catfish (Ictalurus punctatus) and the fish were fed daily. A revolving plate-type biofilter was used. Three field varieties of tomatoes were planted in outdoor hydroponic tanks. Three production units were operated during the 1976 growing season. All significant water quality variables were monitored. Performance was evaluated in terms of water quality, vegetative and fruit production of the tomatoes, and growth of the fish. Fish survival was high, but growth was below maximum because the temperature in the system was below optimum. The average loading rate of fish for the three units at harvest was 31.5 kg/unit, 489 g/tomato plant, 1.9 kg/m2 of hydroponic area, and 691 g/m2 of biofilter surface. Excellent water quality was maintained. The biofilter satisfactorily converted the waste to nitrate-N and phosphate-P and the hydroponic system removed these end products from the water. Nutrients were periodically added to supplement the nutrients from fish waste. Tomato yield was approximately twice that either demonstrated or expected in field production of the same varieties, and the hydroponically produced tomatoes were of better quality than the same varieties grown under field conditions. (EIS-Deal)
W78-08884

MEDIATION OF ACID STRIP MINE POLLUTION BY THE ATTEMPTED INHIBITION OF THE IRON-OXIDIZING AUTOTROPH, THIOBACILLUS FERROOXIDANS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W78-08885

DISPOSAL IN THE MARINE ENVIRONMENT: AN OCEANOGRAPHIC ASSESSMENT.
National Research Council, Washington, DC. Ocean Disposal Study Steering Committee.
Available from the National Technical Information Services, Springfield, VA 22161 as PB-274 056, Price codes: A05 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, 1976. 86 p, 2 fig, 2 tab, 129 ref, 2 append. 68-01-2430.

Descriptors: *Water pollution control, *Waste disposal, Monitoring, Legislation, *Outer Continental Shelf, *Ocean dumping.

This study reviews and integrates scientific and technical information on ocean disposal to develop concepts for monitoring and regulating this practice. The objective is to provide, as a basis for EPA's future regulatory decisions, a rationale that considers ocean disposal in terms both of the need for ocean disposal, and of the capacity of the marine ecosystem to receive wastes. This objective, agreed upon by the Environmental Protection Agency and the study group, involves the discharge of waste into one medium only--the ocean. The report first describes the current legislation and regulations that form the background of the waste disposal problem. Next, it discusses the amount and properties of waste materials and the processes that affect their distribution and fate in the marine environment; these properties and processes form the general scientific constraints on alternatives for management. The system under which the Environmental Protection Agency currently operates is next evaluated through examination of desirable practices for site selection and site monitoring. The final section offers recommendations for further development of solutions to the problem of incorporating existing scientific information in the management of ocean disposal. (Sinha-OEIS)
W78-08886

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 1.
Bureau of Land Management, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 700, Price codes: E15 in paper copy, E15 in microfiche. Department of Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Volume 1, July 1975. 82 fig, 108 tab.

Descriptors: *Environmental effects, *Resources development, *Leases, Baseline studies, Oil pollution, Coasts, Continental margin, Water pollution effects, *Outer Continental Shelf, *Environmental Impact Statement, Marine environments, Coastal environments, Oil and gas, Gulf Coast, Alaska coast.

It is proposed to accelerate Outer Continental Shelf oil and gas leasing in the years 1975 through 1978. This acceleration would occur nation-wide according to a revised proposed OCS planning schedule of six proposed lease sales for 1975 and six possible lease sales per year for the period 1976-1978, including some or all frontier areas by the end of 1978. This definition of the proposed action is a modification of the definition given in the draft environmental statement on accelerated OCS leasing. A tentative planning schedule was published in November 1974. An updated planning schedule was published in June 1975 and the regions used in the schedule, both geographic and geologic are depicted. This schedule incorporates the sales to be considered in 1975. Comments received from the public, as well as further internal review, have persuaded the Department to drop specific acreage figures as planning targets. It now appears more feasible to plan the program in terms of possible areas to be open for leasing and a certain number of sales per year. Hence the target figure of 'ten million acres' to be leased in 1975 has been dropped as an element of this proposal. Volume 1 contains a description of the proposed action and a description of the environment which includes the offshore environment, the nearshore and coastal zone environment, and significant and potential vulnerable resources. (See also W78-08892 and W78-08893) (Sinha-OEIS)
W78-08891

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 2.
Bureau of Land Management, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 701, Price codes: A17 in paper copy, A01 in microfiche. Department of Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Volume 2, July 1975, 1045 p.

Descriptors: *Environmental effects, *Resources development, *Leases, Baseline studies, Oil pollution, Coasts, Continental margin, Water pollution effects, *Outer Continental Shelf, *Environmental Impact Statement, Marine environments, Coastal environment, Oil and gas, U.S. Gulf Coast.

It is proposed to accelerate Outer Continental Shelf oil and gas leasing in the years 1975 through 1978. This acceleration would occur nation-wide according to a revised proposed OCS planning schedule of six proposed lease sales for 1975 and six possible lease sales per year for the period 1976-1978, including some or all frontier areas by the end of 1978. Volume 2 contains the environmental impact of the proposed action, mitigating measures, and unavoidable adverse environmental effects. (See also W78-08891 and W78-08893) (Sinha-OEIS)
W78-08892

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 3.
Bureau of Land Management, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 702, Price codes: E16 in paper copy, E16 in microfiche. Department of Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, Volume 3, July 1975, 936 p.

Descriptors: *Environmental effects, *Resources development, *Leases, Baseline studies, Oil pollution, Coasts, Continental margin, Water pollution effects, Alaska, California, *Outer Continental Shelf, *Environmental Impact Statement, Marine environments, Coastal environments, Oil and gas, Gulf Coast.

It is proposed to accelerate Outer Continental Shelf oil and gad leasing in the years 1975 through 1978. This acceleration would occur nation-wide according to a revised proposed OCS planning schedule of six proposed lease sales for 1975 and six possible lease sales per year for the period 1976-1978, including some or all frontier areas by the end of 1978. Volume 3 contains the attachments which include OCS regulations; operating orders - Gulf of Mexico and Pacific; proposed operating orders - Gulf of Alaska; OCS Research Management Advisory Board Charter; geological survey response to Energy Under the Oceans; report on the responses received in reply to the request for comments on potential future OCS oil and gas leasing; full text comments on proposal from State of Alaska; full text of comments on proposal by Southern California Council of Local Governments; proposed regulations regarding conduct of geological and geophysical explorations of the OCS; list of references; and glossary. (See also W78-08891 and W78-08892) (Sinha-OEIS)
W78-08893

BIODEGRADATION OF OIL IN SEAWATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, CA.
T. B. O'Neill.
Final Report to Office of Naval Research, June 1, 1977. 12 p, 4 ref. N00014-76-WR60021.

Descriptors: *Oil pollution, *Biodegradation, *Water pollution control, Oil spills, Microbial degradation, *Outer Continental Shelf, Hydrocarbonoclastic activity.

The isolation and utilization of pure and mixed microbial cultures for experiments on the biodegradation of crude oil Bunker C fuel and marine diesel is described. Many microbial species were found that had hydrocarbonoclastic activity. When pure cultures were combined in mixtures the activity was much greater, 91% oxidation in seven days, than the activity of any one of the component species when used in a pure culture. (Sinha-OEIS)
W78-08898

ECOLOGICAL EVALUATION OF PROPOSED DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS.
California Univ., Bodega Bay. Bodega Marine Lab.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W78-08899

CONTINUING DEVELOPMENT OF THE VULNERABILITY MODEL,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5B.
W78-08904

PROCEEDINGS OF A WORKSHOP ON PATTERN RECOGNITION APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs; and Coast Guard Research and Development Center, Groton, CT.; And TEEE Computer Society, Long Island, CA.
For primary bibliographic entry see Field 5A.
W78-08934

DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME II: TRANSPORTATION AND WASTE DISPOSAL SYSTEMS.
Dames and Moore, Salt Lake City, UT; and EIC Corp., Newton, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 914, Price codes: A06 in paper copy, A01 in microfiche. Report to NOAA, Office of Marine Minerals, August 1977. 126 p, 34 ref. Contract 7-35169.

Descriptors: *Metals, *Manganese, *Resources development, *Environmental effects, Transportation, Waste disposal, Water pollution control, *Outer Continental Shelf, Underwater mining, Nodules.

This report brings together technological information pertinent to the processing of manganese nodules mined from the sea floor and to help access the effects of manganese nodule processing activities on land and marine environments. It treats potential methods, operations, and requirements for processing and handling manganese nodules on land and at sea, including recovery of value metals, transport of manganese-nodule ore and process wastes, treatment and disposal of wastes, material and energy balances and resource requirements. This volume describes the most likely systems for transporting manganese nodules from the mining ship to port and from the port to the process plant. It also describes waste transport and disposal methods most likely to be used by the industry. (See also W78-08957)
W78-08956

FEDERAL PROTECTION OF INSTREAM VALUES,
For primary bibliographic entry see Field 6E.
W78-08969

OIL SPILL IN BERMUDA: A CASE STUDY OF EFFECTIVE LITIGATION,
Harvard Univ., Cambridge, Div. of Applied Sciences. MA.
T. D. Sleeter, and J. N. Butler.
Environmental Conservation, Vol. 5, No. 1, p 21-24, (Spring, 1978). 2 fig.

Descriptors: *Penalties(Legal), *Oil spills, *Foreign countries, Judicial decisions, Oil pollution, Gas chromatography, Water pollution sources, Analytical techniques, Pollution taxes(Charges), Law enforcement.

The problem of identifying the source of spilled oil has prompted much recent research and controversial discussion. Only one case has resulted in a criminal charge being made against the pollution vessel's captain. However, this case was dismissed because of lack of jurisdiction based on the vessel's location at the time of discharge. The author outlines the proof and precedents involved in a Bermuda case which did result in the captain's liability for the clean-up costs of the oil spill. Swift action in obtaining a sample of the spilled oil and subsequent analysis by gas chromatography showed that the ship's fuel oil matched the spilled oil. This chemical evidence, together with a witness' statement, led to the captain being charged with violating the Bermuda Oil Pollution Act (BOPA) of 1973. Such strong evidence led the captain to retract his original denial of connection with the spilled oil. Most importantly, this case on appeal led to a valuable precedent. The Bermuda Supreme Court imposed absolute liability under the BOPA on the master of a vessel for polluting discharges, irregardless of his knowledge of their nature. (Baumbach-Florida)
W78-08970

CORPS CONFIRMS POLICY AGAINST 'UNNECESSARY' DEVELOPMENT IN WETLANDS.
For primary bibliographic entry see Field 6E.
W78-08972

OUR SALTY RIVERS: LEGAL AND INSTITUTIONAL APPROACHES TO SALINITY MANAGEMENT,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-08973

THE EPA'S POWER TO ESTABLISH NATIONAL EFFLUENT LIMITATIONS FOR EXISTING WATER POLLUTION SOURCES.
University of Pennsylvania Law Review, Vol. 125, No. 1, p 120-166 (November, 1976).

Descriptors: *Water pollution control, *Administrative agencies, *Federal Water Pollution Control Act, *Legal aspects, Industrial wastes, Regulation, Sanitary engineering, Effluents, Waste water treatment, Sewage effluents, Waste disposal, Waste water(Pollution), Water law, Water pollution, Water quality standards, Water pollution sources, Water quality control, Federal government, Federal jurisdiction, Administration, Judicial decisions.

The Environmental Protection Agency (EPA) provides definitions of levels of technology, which must be applied by distinct categories of industrial point sources of effluent discharge, by promulgating guidelines for effluent limitations. The amendments of the Federal Water Pollution Control Act (FWPCA) authorize the EPA to promulgate 'standards of performance' for new point source polluters. But neither the language nor the legislative history of the FWPCA provide clear authority for direct EPA control, as opposed to state control through the permit process, over existing sources. At issue is the distribution of authority between state and national governments. However, when the two conflicting interpretations of FWPCA section 301 (6) are compared, it becomes clear that little significant difference exists between them concerning the balance of state and national power. The EPA has the power to effectively establish actual minimum effluent limitations through the use of FWPCA section 304 (6) guidelines even if it lacks the power to issue section 301 (6) effluent limitations. Therefore, it cannot be said that recognition of the EPA's authority to issue national effluent limitatons would disturb the FWPCA's intended allocation of power between state and national governments. (Jordan-Florida)
W78-08977

A PROCEDURAL FRAMEWORK FOR IMPLEMENTING NONPOINT SOURCE WATER POLLUTION CONTROL IN IOWA.
Iowa Law Review, Vol 63, No 1, p 184-229 (October, 1977).

Descriptors: *Iowa, *Water pollution control, *Water quality, *Agricultural runoff, *Soil conservation, Water pollution, Pollution abatement, Discharge(Water), Runoff, Administration, Land use, Pollutants, Lakes, Groundwater, Sediments, Erosion, Surface runoff, Turbidity, Federal Water Pollution Control Act.

Nonpoint source water pollution is a major environmental problem in Iowa and much of the United States. Precipitation runoff causes large amounts of sediment to wash into waterways. In Iowa, agricultural runoff and soil erosion have resulted in turbid, bacteria-laden streams. Throughout the country, nonpoint source water pollution has been ignored in pollution abatement plans, due to difficulties in administering vast but necessary programs and past emphasis upon point source water pollution. However, Section 208 of the Federal Water Pollution Control Act (FWPCA) authorizes a program of waste treatment management planning to aid the control of nonpoint source water pollution. The implementation of this program is years behind schedule. The author evaluates alternative administrative structures and procedural devices that could be incorporated into the FWPCA Section 208 control system. In addition, the author presents technical background information relating to nonpoint source water pollution, and discusses substantive control techniques, existing environmental regulatory agencies and administrative procedural requirements within Iowa. The author concludes that the Iowa plan should use the discretionary FWPCA Section 208 Best Management Practices system applied by mandatory control requirements, supplemented with public participation, and managed by intermediate level river basin authorities. (Quarles-Florida)
W78-08984

FLORIDA REGIONAL COASTAL ZONE ENVIRONMENTAL QUALITY ASSESSMENT, REGION 3, NORTH COASTAL FLORIDA.
North Central Florida Regional Planning Council, Gainesville.
September, 1976. 8 tab, 62 p.

Descriptors: *Florida, *Coasts, *Planning, *Water quality, *Environmental effects, Air pollution, Beaches, Climate, Coastal plains, Currents(Water), Drainage, Environment, Estuaries, Fisheries, Geology, Groundwater resources, Gulf Coastal Plain, Gulf of Mexico, Seashores, Sediment control, Shores, Management.

The environmental quality of the Gulf coasts of Dixie and Taylor counties in north central Florida is generally excellent with few problems of regional significance. Major concerns at present are the potential reduction of species diversity and numbers due to forestry harvesting practices and forest drainage. The most significant problem in this region appears to be the effect of the industrial discharge of treated effluent from paper mills. Another major problem in development of the region is due to storm events, which have the capability of raising water levels by 14 feet during the 100 year storm. Such an event would flood the entire coastline up to ten miles inland. The region does have potential problems including: (1) construction and dredge and fill operations in the coastal marsh and estuary systems, (2) utilization of groundwater resources, (3) improvement of public wastewater and disposal systems, (4) oil spill potential, (5) development in flood plains, and (6) damage to seagrass beds from modern shrimp trawling practices. Nevertheless, the problems associated with coastal development in the more densely developed areas of Florida have not yet occurred in these counties. (Jordan-Florida)
W78-08986

FLORIDA ENVIRONMENTALLY ENDANGERED LANDS PLAN.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
For primary bibliographic entry see Field 6G.
W78-08988

EXECUTIVE SUMMARY OF SECTION 208 PROGRAM FOR DESIGNATED AREAS. FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 163, Price codes: A12 in paper copy, A01 in microfiche. October, 1974. 13 p.

Descriptors: *Water pollution control, *Water quality control, *Sewage treatment, *Legislation, *Federal Water Pollution Control Act, Legal aspects, Water law, Water pollution, Water quality, Aquatic life, Conservation, Local governments, Federal government, Management, Recreation facilities, Regional development, Regulation, Surveys, Planning, Administrative agencies, Governmental interrelations.

This summary provides a brief review of major elements of the section 208 water pollution control program for designated areas administered by the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). A primary goal of the FWPCA is to achieve by 1983 a level of water quality that supports aquatic life and recreation in and on the nation's waters. Application of the FWPCA Section 208 program to specific problems and areas is discussed, as well as the program's major features. The major issues which have arisen concerning various aspects of this program involve institutional arrangements, land use, development policy, relationship of areawide and facilities planning, and planning in undesignated areas. Also discussed are major features of the EPA Draft Guidelines for Areawide Waste Treatment Management Planning. These guidelines are intended to assist designated local planning agencies in the development of an areawide waste treatment implementation program. (Quarles-Florida)
W78-08990

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES,
Environmental Protection Agency, Washington, DC. Office of Federal Activities.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 527, Price codes: A07 in paper copy, A01 in microfiche. October, 1975. 121 p.

Descriptors: *Environmental effects, *Federal Water Pollution Control Act, *Air pollution, *Industrial wastes, *Water pollution control, Federal government, Environment, Permits, Pollutants, Industries, Water pollution, Environmental control, Evaluation, Regulation, Classification, Rubber, Oil industry, Organic compounds, Chemical industry, Steam, Administrative agencies.

The Environmental Protection Agency (EPA) requires all applicants for permits to discharge pollutants to submit an environmental questionaire provided by the agency. This requirement conforms with the mandate of the National Environmental Policy Act of 1969 and the amended Federal Water Pollution Control Act. These guidelines are intended to aid permit applicants in the preparation of environment assessments. The guidelines include sections on the description of the proposed new source of pollution, the effect on the environment without the proposed action, environmental effects of the proposed new source, and alternatives to the proposed new source. Assements guidance is provided for all industrial categories and appendices provide more detailed guidance for specific industrial categories. However, appendices are not available for all industrial categories, but guidance will be provided on a case by case basis by the EPA regional administrator. Specific appendices are provided for the following industries: rubber processing; petroleum refining; organic chemicals; and the steam supply and non-contact cooling water industries. (Quarles-Florida)
W78-08992

REPORT FOR THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT, OF THE SENATE COMMERCE COMMITTEE HEARING ON MERCURY CONTAMINATION UNDER THE DIRECTION OF SENATOR PHILLIP A. HART, AT MT. CLEMENS.
Federal Water Quality Administration, Chicago, IL. Great Lakes Region.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 147, Price codes: A07 in paper copy, A01 in microfiche. May 1, 1970. 146 p.

Descriptors: *Great Lakes, *Mercury, *Federal government, *Pollution abatement, *Water quality control, Lake Erie, Toxicity, Public health, Industrial wastes, Water pollution sources, Michigan, Fish, Sediment-water interfaces, Pollutants, Water pollution, Water quality, Canada, Aquatic life.

The use of large quantities of mercury in industrial processes has resulted in significant mercury pollution of the Great Lakes and connecting tributaries. Mercury is used as a chemical catalyst, in electrical apparatus, in agricultural and pharmaceutical products, and in many other industrial processes. Mercury's high toxicity and biological magnification cause concern for its introduction into ground or surface waters. Mercury pollution in the Great Lakes became apparent in 1970 when the Canadian government suspended fishing in certain areas and impounded fish shipments. The information collected now supports a ban on commercial fishing due to significant mercury concentrations in the fish in Lake St. Clair and Lake Erie. The mercury concentrations of various water samples were all below the detectable testing levels. Extremely high concentrations of mercury were bound in sediments, especially downstream from certain chemical plants. Actions initiated to clear up Lake Erie include enforcement workshops in various cities, formation of a special investigative task force on Lake Erie water pollution, and increased monitoring of the effects of mercury on fish and other aquatic life in the lake. (Molloy-Florida)
W78-08993

THE RIGHT OF INTERVENTION OF COASTAL STATES ON THE HIGH SEAS IN CASES OF POLLUTION CASUALITIES,
New Brunswick Univ., Fredericton. Law School.
C. C. Emanuelli.
University of New Brunswick Law Journal, Vol 25, p. 79-96, June 1976.

Descriptors: *Oceans, *Oil pollution, *Transportation, *Coasts, Remedies, Law enforcement, Penalties(Legal), Governmental interrelation, Pollution abatement, Ships, International law, Water pollution.

The oil tanker Torrey Canyon ran aground 12 miles off the British coast in 1967 causing major pollution damage to the British and French coasts. To abate the damage, the British government decided to fire the ship, contrary to international legal principles. The right of intervention was clearly expressed under the 1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties and may

be exercised when there is actual or threatened pollution. There are limitations on when intervention may be exercised under the Convention. The Convention also provided for settlement of disputes and compensation for damages where applicable. Three principles explain the right of intervention by coastal states: self-defense, self-protection, and necessity, which was applicable in the Torrey Canyon incident. Although the convention has limited the right of intervention to oil pollution incidents, it is not intended to prohibit a nation from protecting itself from other pollutants as well. Canada has joined the Convention because it feels the Concention is incomplete in that it fails to acount for pollution resulting from seabed exploration. (Maass-Florida)
W78-08996

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 43, No. 4, p. 1256-1258, (January 6, 1978).

Descriptors: *Administrative agencies, *Federal Water Pollution Control Act, *Permits, *Water pollution sources, Adjudication procedure, Administration, Administrative decisions, Legal aspects, Judicial decisions, Legislation, Pollution abatement, Regulation, Water law, Water pollution, Water pollution control, Water pollution treatment, Environment, Effluents, Standards, Discharge(Water).

Herein the Environmental Protection Agency (EPA) has proposed amendments to its regulations governing state National Pollutant Discharge Elimination System (NPDES) programs. These amendments have two purposes: (1) to conform the regulations to the requirements of the settlement agreement approved by the district court for the District of Columbia in National Resources Defense Council, Inc. V. Train; and (2) to clarify the procedures under which EPA will exercise its power to object to the issuance of state NPDES permits. The settlement agreement requires a new program for the establishement by EPA of effluent limitations guidelines, new source performance standards, and pretreatment standards. To assure national uniformity in water pollution control, the proposed regulations will implement the requirements of the agreement with reference to all the states. Under the proposed regulations, states must modify, or alternatively, revoke and reissue permits when new guidelines for best available technology economically achievable are issued. Permits issued by EPA are subject, under the settlement agreement, to similar requirements. Under these proposed regulations, the EPA Regional Administrator and the state would work together in formulating the NPDES permits and ensuring that the supporting record is complete. (Jordan-Florida)
W78-08997

REQUIREMENTS FOR APPROVAL OF DISCHARGES TO AQUACULTURE PROJECT.
Title 40, Code of Federal Regulations, Part 115, sections 115.1-115.17 (July 1, 1977).

Descriptors: *Federal Water Pollution Control Act, *Aquaculture, *Water permits, *Water pollution control, Permits, Legislation, Administrative agencies, Water pollution sources, Water pollution treatment, Regulation, Aquatic environment, Crop production.

An aquaculture project is a defined managed water area which uses pollutants discharged into a designated project area for the maintenance, propagation and production of harvestable freshwater, estuarine, or marine plant or animal species. These Environmental Protection Agency (EPA) regulations provide procedures and guidelines for the approval of an aquaculture project and any discharges of pollutants associated with the project. The regulations control discharges otherwise unlawful under the Federal Water Pollution Control Act in order to determine the feasibility of using pollutants to grow beneficial aquatic organisms. These regulations do not apply to aquaculture facilities which do not utilize discharges of wastes from a separate industrial or municipal point source. The EPA Regional Administrator will issue a permit authorizing a discharge if it is determined the intended aquaculture crop will not have a significant potential for human health hazards, that the intended crop has commercial value or will be used as a food source, and that there will be minimal deleterious effect on the flora and fauna which are indigenous to the area. (Curtis-Florida)
W78-09000

UNITED STATES STEEL CORPORATION V. ILLINOIS POLLUTION CONTROL BOARD (VALIDITY OF STATE WATER POLLUTION CONTROL REGULATIONS; CONSISTENCY WITH FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W78-09010

COMPLAINT OF STEUART TRANSPORTATION COMPANY (LIMITED LIABILITY FOR OIL SPILL CLEAN-UP COSTS).
For primary bibliographic entry see Field 6E.
W78-09013

WYOMING ENVIRONMENTAL QUALITY ACT.
For primary bibliographic entry see Field 6E.
W78-09014

CONTAMINANT TRANSPORT TO DEEP WELLS,
Weston (Roy F.), Inc., Roslyn, NY.
K. J. Phillips, and L. W. Gelhar.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13824, p 807-819, June 1978. 9 fig, 2 tab, 12 ref.

Descriptors: *Pollutants, *Water wells, *Groundwater, *Water pollution, *Groundwater movement, Wastes, Wells, Base flow, Model studies, Soil water movement, Analytical techniques, Mathematical models, Theoretical analysis, Water quality, Nitrates, Soil contamination, *Groundwater quality, Well contamination.

Described herein by analytical and numerical techniques was the process of convective transport of a conservative contaminant to a deep, partially screened pumping well overlain by a zone of contaminated water. The three-dimensional flow to the well was treated as a point sink in an anisotropic medium. The effects of a regional downward flow, a phreatic surface above the well, and an impervious lower boundary were evaluated. The theoretical results were compared with the observed nitrate contamination of wells in Long Island, New York. It was shown that the local convective transport produced due to pumping greatly accelerates the process of contamination and decontamination of the wells. (Henley-ISWS)
W78-09034

WATER QUALITY PROGRESS IN HOLSTON RIVER BASIN,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
J. M. Higgins.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE3, Proceedings Paper 13813, p 515-524, June 1978. 7 fig, 4 tab, 5 ref.

Descriptors: *Water quality, *Pollution abatement, *Tennessee, *Water pollution, *Waste disposal, *Environmental engineering, Environmental sanitation, Public health, Water supply, Sanitary engineering, Sewage disposal, Planning, Domestic wastes, Industrial wastes, Pollutants, Water chemistry, Regional analysis, Waste water(Pollution), *Holston River Basin, *Cherokee Reservoir.

Wastewater discharges of oxygen-demanding wastes, suspended solids, ammonia, and total dissolved solids in the Holston River Basin of northeastern Tennessee have been reduced significantly since 1968. As a result, the quality of downstream rivers and reservoirs has improved. These changes were quantified using available historical data on waste discharges, river quality, and reservoir conditions. Additional improvements are needed, but careful studies will be required to ensure efficient abatement actions. Furthermore, the development of effective national policies will require similar trend assessments of representative basins, as a measure of the benefits received for abatement expenditures. (Henley-ISWS)
W78-09043

TOWARD ENVIRONMENTAL DEMAND MANAGEMENT,
Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6G.
W78-09064

SUMMARY: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE--JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 6G.
W78-09067

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR MARION, NORTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 6G.
W78-09068

A PRE-IMPOUNDMENT WATER QUALITY INVESTIGATION FOR THE PROPOSED GATHRIGHT RESERVOIR.
Environmental Protection Agency, Philadelphia, PA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-09072

FINAL ENVIRONMENTAL IMPACT STATEMENT - NORTH FREMONT COUNTY WASTEWATER FACILITIES.
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 6G.
W78-09073

ACCUMULATION OF DRY MATTER, NITROGEN AND PHOSPHORUS BY CULTIVATED WATER, HYACINTHS,
Alabama Agricultural Experiment Station, Auburn.
C. E. Boyd.
Economic Botany, Vol 30, No 1, p 51-56, January-March, 1976. 4 tab, 18 ref.

Descriptors: *Nutrient removal, *Nitrogen, *Alabama, *Water hyacinths, *Phosphorus, *Primary production, *Dry matter production.

On May 1, 1973, fifty water hyacinths were stocked in a 3.2 X 6.4 m enclosure in each of three

ponds in Auburn, Alabama. Triple superphosphate and ammonium nitrate were broadcast over the surface of the ponds between February 5 and September 9, 1973 at 2-week intervals. Water hyacinths were sampled on June 20, July 9, September 5, and September 28, 1973. Average rates of nitrogen and phosphorus removal over the entire growth period were 3.4 and 0.43 kg/ha/day, respectively, or an estimated accrual of 1.20 metric tons of nitrogen and 0.14 metric tons of phosphorus in climates conductive to year round growth. Upper and lower limits for dry matter production and nutrient uptake over a 12-month growing season, based on highest and lowest growth and nutrient absorption rates, were 39 to 142 metric tons/ha, 0.8 to 1.8 metric tons N, and 0.1 to 0.3 metric tons P. Average percentages of nitrogen in harvested plants decreased from June to September. Average phosphorus concentrations in plants were similar on June 20 and September 28, but were slightly lower on the other two dates. (Stihler-Mass)
W78-09089

DEICING SALT MOVEMENT AND ITS EFFECTS ON SOIL PARAMETERS AND VEGETATION,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-09122

MANAGEMENT OF IRRIGATION STREAM SIZE FOR IMPROVED RUNOFF WATER QUALITY,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
R. G. Allen, J. R. Busch, G. C. Lewis, and D. W. Fitzsimmons.
Paper No 77-2570 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December, 13-16, 1977, Chicago, Illinois, 9 p, 6 fig, 1 tab, 8 ref.

Descriptors: Irrigation, *Runoff, *Water quality, *Irrigation water, *Furrow irrigation, Erosion, Sediments, Nutrients, *Irrigation efficiency.

A study of water quality changes between applied irrigation water and runoff for two furrow irrigated 0.89 ha plots is reported. Furrow streams on one plot were cutback to minimize runoff and erosion, and the second plot was used as a control. Losses of sediment and nutrients from the cutback-irrigated plot were much less than lost from the control, and the water-use efficiency was 73 percent versus 41 percent for the control. (Skogerboe-Colorado State)
W78-09128

RESOURCE ADEQUACY IN LIMITING SUSPENDED SEDIMENT DISCHARGES FROM AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 2J.
W78-09141

TILLAGE SYSTEM EFFECTS ON RUNOFF WATER QUALITY: PESTICIDES,
Iowa State Div., Ames. Dept. of Agricultural Engineering.
J. L. Baker, and H. P. Johnson.
Paper No. 77-2504B presented at the 1977 Winter Meeting, American Society of Agricultural Engineers. December 13016, 1977, Chicago, Illinois, 14 p, 2 fig, 4 tab, 17 ref.

Descriptors: *Pesticides, Runoff, Sedimentation, Corn(Field), Erosion, Soil erosion, Sediments, Water quality, *Agricultural runoff, *Cultivation, Pollutant identification, Path of pollutants.

Pesticide runoff losses in sediment and water were measured for six small watersheds planted to continuous corn by three tillage systems, conventional, till-plant, and ridge-plant. Decreased runoff and erosion for the till-plant and ridge-plant systems resulted in decreased pesticide losses; however pesticide concentrations insediment and/or water were sometimes higher (relative to conventional). (See also W78-09146) (Skogerboe-Colorado State).
W78-09145

IRRIGATION RETURN FLOW MODELING--A STATE OF THE ART,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker.
Paper No. 77-2503 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 18 p, 4 tab, 54 ref.

Descriptors: *Return flow, *Model studies, *Simulation analysis, Computer programs, Groundwater, Nitrogen, Irrigation, Irrigation effects, *Reviews.

Forty-three models which have been developed and tested for simulation of irrigation return flow systems have been collected and evaluated. This paper discusses what seems to be some of the more critical problems in using these models, the relative strengths of those existing models, and important research and development needs for maximizing their utilization in the future. (Skogerboe-Colorado State)
W78-09147

SIMULATION OF NUTRIENT LOSSES FROM CROPLAND,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-09148

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5B.
W78-09151

PHOSPHORUS FERTILIZATION OF FISH-PONDS IN THE UPPER GALILEE,
Mekorot Water Co., Tiberias (Israel). Lake Kinneret Watershed Lab.
For primary bibliographic entry see Field 5C.
W78-09156

OBSERVATIONS ON THE USE OF ORGANIC FERTILIZERS IN INTENSIVE FISH FARMING AT THE GINOSAR STATION IN 1976,
Intensive Fish Culture Station Ginosar (Israel).
For primary bibliographic entry see Field 5C.
W78-09157

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-09174

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF BASUDIN IN WATER BODIES (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Inst. Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5A.
W78-09181

RECLAMATION OF OPEN-PIT QUARRIES FOR MULTIPLE USES,
Bissell and Karn, Inc., San Leandro, CA.
For primary bibliographic entry see Field 6F.
W78-09182

MAINTAINING WATER QUALITY IN VOYAGEURS NATIONAL PARK,
Minnesota Pollution Control Agency, Roseville.
W. H. Anderl.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. UP1, p 117-126, July 1977. 1 fig, 3 tab, 5 ref.

Descriptors: *Water quality control, *Recreation facilities, *Land use, *Planning, *Forecasting, *Methodology, *Data collections, Eutrophication, Parks, Public health, Water resources, Management, Hydrology, Assessment, Aesthetics, Natural resources.

Voyageurs National Park is a recreational area with a high degree of water-based and water-oriented recreation and requires water quality surveillance. Bench mark (baseline) water quality data collected from 20 bench mark stations in the park allow the definition of water quality in the 'natural' environment. The types of data required to assess potential water quality problems are identified. Water quality assessment is a necessary component of the overall recreational planning process. The goal of water quality assessment is to use predictive tools to provide decision makers with the best attainable insight to the impact of planning alternatives on delineated water quality problems. A procedural framework for organizing and executing a technically sound assessment of water quality problems is presented. The steps are: (1) delineation of water quality problems; (2) analysis of hydrology; (3) selection of assessment methods (herein, information matrices and descriptive assessment method); (4) identification, collection, and collation of required data; (5) data analysis, method formulation, and testing of predictive capability; (6) forecasting impacts of planning alternatives; and (7) communication of results. (Bell-Cornell)
W78-09183

A REVIEW OF CONFLICT RESOLUTION MODELS IN WATER RESOURCES MANAGEMENT,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09192

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 2G.
W78-09213

A FORMAT FOR PLANNING A COMMECIAL MODEL AQUACULTURE FACILITY,
Kramer, Chin and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 6B.
W78-09228

ANALYSIS OF COSTS OF POLLUTION CONTROL.
Organization for Economic Co-operation and Development, Paris (France).
Publication No. 89514, 1973. 9 p, 2 tab.

Descriptors: *Organization for Economic Cooperation and Development, *Cost analysis, *Pollution abatement, *International trade, Costs, Economics, Balance of payments, Industries, Governments, Resource allocation, Gross national product.

Estimates of pollution control costs of member nations of the Organization for Economic Cooperation and Development (OECD) were analyzed for economic significance. While the imperfect available data does not provide a solid basis for economic analysis, and there are practically no estimates of savings resulting from pollution control, some preliminary observations can be made. Present cost estimates, valid only for the next few years, are provisional and should be used with caution. In addition, Japan's pollution control costs are increasing faster--and problems will be more serious--than in the other member countries upon which these remarks are based. Pollution control costs will be much lower than other welfare-oriented expenditures and defense spending. The shift in resource use caused by pollution control measures will probably not be greater than many other changes. As pollution control will probably increase in all major industrial members of the OECD, effects of pollution control measures on international trade. Pollution control in individual plants and parts of an industry may affect their competitive position, both in international and internal trade. Some data for selected countries is included in this report. (Lynch-Wisconsin)
W78-09232

IMPLEMENTATION OF POLLUTION CHARGES.
Organization for Economic Co-operation and Development, Paris (France).
Publication No. 28182, 1976. 7 p.

Descriptors: *Organization for Economic Cooperation and Development, *Pollution taxes(Charges), *Pollution abatement, *Regulation, *Implementation, International organizations, Noise pollution, Water pollution control, Poisons, Solid wastes, Sulfur dioxide, Particulates, Water management(Applied), Pollutants, Cost-effectiveness, Economics, Incentives, Redistribution, Social participation, Amenity.

Pollution charges, usually used in conjunction with direct regulation, stimulate technical progress by inducing reduced pollution. A pollution charge is a payment to appropriate authorities for each unit of pollutant above a certain specified level (possibly zero), or on each unit of disamenity imposed on the community. Pollutant and disamenity are expressed in 'assessment units'; the charge is found by multiplying the unit charge rate by the number of assessment units discharged per unit of time. The basis for charge assessment must be representative, simple, and acceptable. Representativeness means selecting pollution parameters which are primary causes of environmental deterioration. Simplicity requires limiting parameters to those which are easy to measure. Public acceptability depends on the system's simplicity and on involvement by affected parties in decision-making. Whee charges are not sufficiently high to be incentives, they perform a redistribution function. In such cases, proceeds may be allocated in a way which minimizes total pollution control costs. These concepts are applied in this paper to five sectors: (1) water management, (2) control of particulate and sulfur dioxide emissions, (3) solid wastes, (4) noise pollution, and (5) toxic wastes. Care must be taken to avoid transferring pollution from one medium to another as a by-product of pollution charges. (Lynch-Wisconsin)
W78-09233

NOTE ON THE IMPLEMENTATION OF THE POLLUTER-PAYS PRINCIPLE.
Organization for Economic Co-operation and Development, Paris (France).
Publication No. 5839, May 1974. 3 p.

Descriptors: *Polluter-pays principle, *Economics, *Pollution abatement, *Pollution taxes(Charges), *Cost allocation, *International organizations, Organization for Economic Cooperation and Development, Regulation, International waters, Natural resources, Costs, Regional development, Implementation, Administration, Governments.

Guiding principles of the Organization for Economic Cooperation and Development (OECD) state that the polluter must bear such expenses 'to ensure that the environment is in an acceptable state.' 'Acceptable state' implies that the advantage of further reduction in residual social damage is smaller than the social cost of further prevention and control. The principle, covering costs of both control and prevention, constitutes a means of cost allocation, and does not involve reducing pollution to any specified optimum level. The principle also helps make private costs of goods and services reflect relative scarcity of resources used in their production. In terms of conformity to the PPP, it is irrelevant whether the polluter passes some or all environmental costs on to consumers or absorbs them. Implementation may take the form of: (1) process and product standards, (2) individual regulation, (3) pollution charges, or (4) a combination of instruments. Choice of method can only be made by central or regional public authorities in the light of such factors as data requirements and administrative costs. Pollution charges require a comprehensive policy to make explicit the relationship of the charges to environmental policy objectives. Aid to polluters or exceptions to the PPP are justified only during transitional periods in order to speed pollution abatement or economic development, or when implementation would jeopardize the social and economic policy objectives of a country or region. (Lynch-Wisconsin)
W78-09234

SANITARY PROTECTION OF WATER BODIES IN CONNECTION WITH EXTRACTION AND ENRICHMENT OF RARE METALS (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
E. D. Savilov, and L. F. Yanygina.
Gig Sanit (3), p 99-101, 1977.

Descriptors: *Industrial wastes, Pollution, *Toxicity, *Metals, *Acids, *Hydroxamic acids, Ions, Metal ions, Iron, Antimony, Manganese, Copper.

A series of studies indicated that sewage from mines and enrichment factories for rare metals (Fe, As, Mn, Cu) was polluted with suspended substances and metal ions. The flotation agent IM-50 and its component C6-C10 hydroxamic acids give water a specific odor and are stable in water, causing a negative effect on the sanitary state of water bodies resulting from an increased biochemical oxygen demand. In experiments on rats, IM-50 and C6-C10 hydroxamic acids mainfest a toxic effect predominantly on the blood system and functional state of the liver.--Copyright 1978, Biological Abstracts, Inc.
W78-09235

SURVEY OF POLLUTION CONTROL COST ESTIMATES MADE IN MEMBER COUNTRIES.
Organization for Economic Co-operation and Development, Paris (France).
1972. 23 p.

Descriptors: *Organization for Economic Cooperation and Development, *Pollution abatement, *Costs, *Air pollution, *Water pollution control, Austria, West Germany, Denmark, Finland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States, Industries, Waste treatment, Governments, Gross National Product.

Estimates of total pollution control costs are given for member nations of the Organizations for Economic Cooperation and Development (OECD). Selected expenditures by country are: (1) Austria--in 1971 investment for wastewater treatment was 1.8 billion schillings (0.5% of GNP). (2) Denmark--for total solid waste control, 500 million kroners (0.4% of GNP). (3) Finland--about 1-2 billion Finnish marks for pollution control (0.2-0.4% of GNP) in the 1970s. (4) Germany--total expenditure for 1971-75, about DM 70.5 billion (1.8% of GNP) for air, water, noise, biocide, and chemical pollution control, the Environmental Policy Program, solid waste management, and nature preservation. (5) Italy--for 1971-75, 1.6 trillion lira for water and air pollution and solid waste management (0.6% of GNP). (6) Japan--for 1971-75, 10 trillion yen for pollution control (1.2-2.1% of GNP). (7) Netherlands--800 million guilders annually by 1975, half for water pollution control (the increase representing 0.5% GNP at 1971 prices). (8) Norway--totals are given only for selected industries. (9) Spain--42 billion pesetas for 1972-75 (78% for water pollution control). (10) Sweden--in 1970 5.7% of total investment in mining and manufacturing. (11) Switzerland--450 Swiss francs in 1969 for the public sector (0.75% of GNP). (12) United Kingdom--partial costs were 449 million pounds in 1968-69 (1% of GNP). (13) United States--annual capital investment will rise from 3.6 billion in 1970 to $9.5 billion in 1980. (Lynch-Wisconsin)
W78-09236

IDENTIFICATION AND SPECIFICATION OF INPUTS FOR BENEFIT-COST MODELING OF PESTICIDE USE,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6A.
W78-09238

'VOGTIA MALLOI,' A NEWLY INTRODUCED PYRALID (LEPIDOPTERA) FOR THE CONTROL OF ALLIGATORWEED IN THE UNITED STATES,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 4A.
W78-09239

WASTE OIL STUDY, REPORT TO THE CONGRESS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5E.
W78-09240

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF ABATE IN BODIES OF WATER (IN RUSSIAN),
Azerbaijan Research Inst. of Virology, Microbiology and Hygiene, Baku (USSR).
V. Yu. Akhundov, D. F. Akhundov, and A. P. Mamedova.
Gig Sanit (10), p 101-103, 1976.

Descriptors: Caralase, Cholin, Esterase, Peroxidase, *Pesticides, *Abate, Experimental animals, *Lethal limit, *Water quality standards, Water pollution effects.

Commercial-grade Abate (88% and 92%) was subjected to a series of tests: Stability in water, effect on the organoleptic indices and sanitary regime (biochemical O2 consumption, ammonification and nitrification processes of bodies of water and effect on rabbits, rats and mice (blood morphology, catalase activity, blood peroxidase, serum cholinesterase) in acute, subacute and chronic experiments. On the basis of results, the maximum permissible concentration of Abate in bodies of water was set at 1 mg/l.--Copyright 1978, Biological Abstracts, Inc.
W78-09242

TECHNOLOGICAL-FORCING AND FEDERAL ENVIRONMENTAL PROTECTION STATUTES,
Washington Univ., Seattle. School of Law.
D. B. La Pierre.

Iowa Law Review, Vol. 62, No. 3, p 771-838, February 1977.

Descriptors: *Water pollution control, *Air pollution, *Legislation, *Standards, *Judicial decisions, *Technology, Federal Water Pollution Control Act, Federal Water Pollution Control Act Amendments of 1972, Clean Air Act, Clear Air Act Amendments of 1970, Environmental Protection Agency, Legal aspects, Pollution abatement, Political aspects, Regulation, Governments, Public health.

Federal regulation of pollution reduction standards indicates that the Environmental Protection Agency and the courts have converted the mandated health-based standard into one based on technology in the case of existing stationary sources of air pollutants, hazardous air pollutants, motor vehicle air pollutants, and toxic water pollutants. The wisdom of the standards actually imposed can be questioned, as well as the propriety of EPA and court action in restriking the general congressional balancing of public health protection and technological and economic feasibility; however, the retreat appears inevitable. Technology-based standards have in practice provided no incentive for major technological innovation. The Clean Air Amendments of 1970 and the provisions on toxic pollutants in the Federal Water Pollution Control Act Amendments of 1972 reflected health-based standards, and explicitly rejected technological and economic considerations as constraints. By contrast, the Federal Water Pollution Control Act is geared more to protection of environmental quality, and provides that the pollution reduction level should be governed primarily by the technological and economic feasibility of equipment, techniques, and methods. In all other pollution-control statutes a middle ground was established between health-based and technology-based standards. In this article each standard is analyzed, and relevant judicial decisions discussed. (Lynch-Wisconsin)
W78-09245

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W78-09268

RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-09277

EFFECTS OF THE ORGANOPHOSPHORUS INSECTICIDES TEMEPHOS (ABATE) AND CHLORPYRIFOS (DURSBAN) ON POPULATIONS OF THE SALT-MARSHES MELAMPUS BIDENTATUS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W78-09285

SUBLETHAL EFFECTS OF INSECT GROWTH REGULATORS UPON CRAB LARVAL BEHAVIOR,
Duke Univ., Beaufort, NC. Marine Lab.
For primary bibliographic entry see Field 5C.
W78-09296

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
A. O. Esogbue, and G. Willeke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 466, Price codes: A11 in paper copy, A01 in microfiche. Georgia Environmental Resource Center, Atlanta, Completion Report ERC-04-78, April 1978. 234 p, 125 ref. OWRT B-116-GA(1), 14-34-0001-6069.

Descriptors: *Operations research, *Systems analysis, *Management, Cities, Model studies, Reviews, Research priorities, *Literature reviews, *Evaluation, Planning, Water supply, Water treatment, Waste water treatment, Distribution systems, *Urban water management, *Technology transfer, Flood control, Reservoir design, Reservoir operation, Recreation, Water pricing, Water demand, Data collections.

The objective was to initiate the closure mechanism between research, implementation and further research. Out of over 1000 papers reviewed in the literature from 1965-1976, 125 papers were subjected to an extensive evaluation. Evaluation of papers was done with respect to technical internal validity (technical evaluation to check various aspects of the model such as data problems, theoretical accuracy of mathematical procedures, appropriateness of statistical and sensitivity analysis, computational problems, etc.); external validity (environmental evaluation to check validity of assumptions regarding water resources environment and systems, significance of end results of study, presentation of procedures and results, implementation aspects, etc.); and technique transferability (author evaluation with respect to problem origin, modelling difficulties and experience, availability of codes, implementation status and knowledge of state of the art since the paper was written).
W78-08952

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-08955

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-09174

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
CP-76-5, International Institute for Applied Systems Analysis Workshop Proceedings, February 11-13, 1975, Edited by Andras Szollosi-Nagy. International Institute for Applied Systems Analysis, Laxenburg, Austria, April, 1976. 136 p, 37 fig, 12 tab, 90 ref. Szollosi-Nagy, A., Ed.

Descriptors: *River basins, *Methodology, *Optimization, *Planning, *Water management(Applied), *Mathematical models, *Systems analysis, Simulation analysis, Dynamic programming, Linear programming, Reservoirs, Constraints, Stochastic processes, Equations, Algorithms, Cost minimization, *Vistula River(Poland), *Tisza River(Poland).

Presented are workshops papers prepared by IIASA scholars and by guest scientists from Hungarian and Polish research institutions. Addressed are particular universal methodological problems of water resources development and optimal operation: River basin management in the Tisza and Vistula River basins provide the framework for discussions of the practical significance of methodological developments. The specific papers consider: (1) the planning and management activities in the Vistula basin; (2) new and previously developed optimization techniques for water management in the Tisza River system; (3) computer simulation to solve a water distribution, flood damage minimization problem in the Hungarian part of the Tisza basin, under the condition of water deficit; (4) a review of conflict-resolution models, including application of the decision analytic model to derive efficient municipal wastewater treatment alternatives along a river; (5) an optimal adaptive prediction algorithm for real time forecasting of hydrological time series; and (6) algorithms for the stochastic inflow-nonlinear objective water reservoir control problem. (See W78-09189 thru W78-09194) (Bell-Cornell)
W78-09188

THE VISTULA RIVER PROJECT,
A. Laski, and J. Kindler.
In: Workshop on the Vistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed.), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 1-20, April 1976. 6 fig, 10 ref.

Descriptors: *Vistual River basin(Poland), *Multiple-purpose projects, *Planning, *Management, *Methodology, *Water resources development, Water requirements, Investment, Cost minimization, Optimization, Simulation analysis, WRM model, Water supply, Water allocation(Policy), Systems analysis, Economic efficiency.

Post World War II has seen a shift toward multiple-purpose water projects in Poland. This paper discusses planning and management activities as part of the national planning process in the Vistula River basin. Considered is a project aimed at meeting water demands projected to the years 1985 and 2000. The Vistula basin, its rivers, and its water resources are described. Discussed next is Poland's planning strategy for the basin, including a spatial and problem-oriented decomposition of the system, directed mainly towards the water supply problem. Given are the list of water control objectives and the steps followed in the planning process. Described is the optimum investment strategy and the WRM simulation-optimization model procedure for deriving the least-cost allocation system. Continuous revision and verification of plans is unavoidable in a rapidly expanding economy; the value of an operational tool for quick evaluation of the consequences to water management of some new development concepts and alternatives cannot be exaggerated. (See also W78-99188) (Bell-Cornell)
W78-09189

SYSTEMS ANALYSIS BASIS OF WATER MANAGEMENT IN THE TISZA RIVER VALLEY,
National Water Authority, Budapest (Hungary). Water Resources Center.
I. Bogardi, C. Bela, and G. Hanko.
In: Workshop on the Vistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed.), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 21-68, April 1976. 12 fig, 5 tab, 28 ref.

Descriptors: *Tisza River basin(Hungary), *Water management(Applied), *Systems analysis, *Model studies, *Optimization, *Economic efficiency, *Reservoirs, Natural conditions, Socio-economic conditions, Projects, Water distribution(Applied), Runoff, Dynamic programming, Linear programming, Long-term planning, Constraints, Flood control, Water demand, Cost minimization, Economic loss minimization, Reservoir storage, Operations research.

The methods of systems analysis appear suited for solving the fundamental problems of water management in the Tisza Valley, for providing econoimcally optimal control and delineating strategy for future development. Described are the prevailing natural, socio-economic and water management conditions in the Tisza River System; considered are flood damage control, water uses, and flow augmentation. Next, systems analysis techniques developed thus far for the Tisza in Hungary are reviewed. Major problems of the System are listed, and models are discussed, including: a comprehensive water distribution model; a multi-stage stochastic programming model for optimum design and control of multipurpose, series-connected storage reservoirs; a mixed linear and dynamic programming model for water distribution; and a dynamic model for planning long-term water resources development; and a flood control model. Finally, a number of models is suggested which meet the stated requirements of a sound system model. An optimum control model for the present system is detailed, including symbols and definitions, the objective function of minimization of economic losses, the constraints, and the necessary data, parameters, and functions. Lastly, a cost minimization, development model of the water management system (excluding flood damage control) is considered. The computerized solution to the problem described can be performed by stochastic dynamic programming. (See also W78-09188) (Graf-Cornell)
W78-09190

RIVER BASIN NETWORK MODELLING AND ITS APPLICATION TO THE TISZA RIVER BASIN,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
P. Koryavov, and i. Belyaev.
In: Workshop on the Vistual and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed.), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 69-93, April 1976. 7 fig, 5 tab, 3 ref.

Descriptors: *Simulation analysis, *Networks, *Computer models, *Overflow, *Water shortage, *Tisza River basin(Hungary), Decision making, Alternative planning, Water distribution(Applied), Optimization, Flood control, Reservoirs, Water demand, Cities, Constraints, Irrigation, Computer programs, Linear programming, Damage minimization, Water deficit, Model data, Equations, Systems analysis.

Computer simulation of complex dynamic systems combined with decision-making techniques becomes one of the principal methods for systems design and is a main goal of the IIASA Wate Resources Project. Herein, possible variants of regional development under the condition of a water deficit are analyzed. An essential part of a simulation system is that which represents the river basin and its development perspectives. Models of this 'block' should begin by selecting reasonable water use aiternatives. By using the model presented in this paper, it is possible to consider the problem of regional water resources use in aggregated indexes. If the exogenous factors, i.e., weather prediction and runoff in a river basin, are given, then planning experts can study the consequences of different measures. The model can be used also to solve optimization problems. Considered is its application to the Hungarian part of the Tisza River Basin; two problems of water resources control which are dealt with are: water distribution among consumers at different time intervals (seasons) during a one-year period; and prevention or reduction of overflow during a flood period, where the objective function is flood damage minimization. The problem is solved using a Matrix Generator and Linear Programming Package. (See also W78-09188) (Bell-Cornell)
W78-09191

A REVIEW OF CONFLICT RESOLUTION MODELS IN WATER RESOURCES MANAGEMENT,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. R. Ostrom.
In: Workshop on the Vistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (Ed), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 95-105, April 1976. 5 fig, 23 ref.

Descriptors: *Conflict-resolution models, *Decision analytical model, *Model studies, *Water quality control, *Waste water treatment, Cities, Optimization, Alternative planning, *Preferences, Reservoirs, River basins, Metagame analysis, Systems analysis.

Reviewed briefly are modeling techniques used to study problems of conflict resolution; these models ignore the underlying preferences of the decision maker(s) and the subjective information available from relevant interest groups. Metagame analysis, however, allows us to deal with relative preferences for outcomes of a single issue where there are competing interests; but this method, as well as those reviewed, does not handle uncertainty rigorously. The decision analytic approach, however, is an improvement over metagame analysis because it allows the modeler to consider a greater amount of subjective information: Preferences, risk aversion, and tradeoffs between objectives and uncertainty can all be treated in a rigorous fashion. Herein, metagame analysis and decision analysis are discussed and compared. Both methods are applied to a problem of finding efficient municipal wastewater treatment alternatives along a river. In addition, for the metagame approach, a problem of development on an international river basin where two countries have opposing interests is examined. (See also W78-09192
W78-09192

AN OPTIMAL ADAPTIVE PREDICTION ALGORITHM FOR REAL TIME FORECASTING OF HYDROLOGIC TIME SERIES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A. Szolosi-Nagy.
In: Workshop on theVistula andTisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 107-127, April 1976. 7 fig, 2 tab, 24 ref.

Descriptors: *Hydrology, *Time series analysis, *Forecasting, *Algorithms, *Real-time, Behavior, Water resources, Kalman filter, Estimating, Linear systems, Reservoirs, Equations, Loss minimization, Cost minimization, Optimization, Stochastic processes, Moving-average models, Autoregressive models, Uncertainty, Mathematical models, Systems analysis, Simulation analysis.

In order to achieve effective control of water resource systems, the future behavior of the inputs to theparticular system must be known. For real-time operation, small computers are preferable, and so prediction algorithms must be suited to these. This is possible using recursive prediction algorithms in which there is no need to store all the past measurements for the porpose of predicting future behavior. This paper outlines the basis of the Kalman filtering technique and proposes a simple state-space-based model for the recursive adaptive estimation of the impulse response of hydrologic system. Discrete time models are considered. The proposed algorithms can be applied to slightly nonlinear and time varying systems using a proper moving data window. having obtained the optimal time varying impulse response(s). Consedered are: state-space representation of hydrologic processes; adaptive sewuential prediction algorithms; and adaptive prediction the of linear hydrologic systems. The objective function is minimization of the chosen loss (cost) function. (See also W78-09188) (Bell-Cornell)
W78-09193

ALGORITHMS FOR THE STOCHASTIC INFLOW-NONLINEAR OBJECTIVE WATER RESERVOIR CONTROL PROBLEM,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Casti.
In: Workshop on theVistula and Tisza River Basins, February 11-13, 1975. Andras Szollosi-Nagy (ed), CP-76-5, International Institute for Applied Systems Analysis, Laxenburg, Austria, p 129-136, April 1976. 2 ref.

Descriptors: *Reservoir operation, *Stochastic processes, *Dynamic programming, *Algorithms, Networks, Control, Computer programs, Optimization, Cost minimization, Constraints, Equations, Mathematical models, Operations research.

In an earlier IIASA internal paper (Casti, 1974) and in private communication to the author (Dantzig, 1975), algorithms to determine the least-cost control of a water reservoir network with stochastic inflows and nonlinear utilities were proposed. Both studies utilized a dynamic programming-type approach, coupled with approximations of one kind or another, in order to yield a computational algorithm in which the bulk of the calculation was carried out by efficient (and rapid) network flow algorithms. The purpose of this note is to present a synthesis of the work in these papers and to spell out the precise steps of an algorithm in sufficient detail to enable a computer program to be constructed. (See also W78-09188) (Bell-Cornell).
W78-09194

IDENTIFICATION AND SPECIFICATION OF INPUTS FOR BENEFIT-COST MODELING OF PESTICIDE USE,
Pennsylvania State Univ., University Park.
D. J. Epp, F. R. Tellefsen, G. A. Shute, R. M. Bear, and K. P. Wilkinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 287, Price codes: A08 in paper copy, A01 in microfiche. EPA-600/5-77-012, Report August 1977. 143 p, 16 fig, 16 tab. 1HB617, R863247-01-1.

Descriptors: *Pesticides, *Pollutants, *Environmental effects, *Cost-benefit analysis, *Model studies, *Aldrin, Pesticide residues, Insecticides, Herbicides, Fungicides, Rodenticides, Corn(Field), Agriculture, Crop production, Economics, Aesthetics, Public health, Opportunity cost, Statistical models, Water pollution effects, Costs.

Data inputs to benefit-cost analysis of pesticide use are defined, delineated, and improved through: (1) classification of pesticide use effects; (2) establishment of valid methods of quantifying such effects; (3) identification of inadequate and erroneous methodology; and (4) illustration of benefit-cost analysis with aldrin used on corn. The report is divided into six sections: (1) Taxonomy of pesticide use effects. (2) establishment of valid methods of quantifying such effects; (3) identification of inadequate and erroneous methodology; and (4) illustration of benefit-cost analysis with aldrin used on corn. The report is divided into six sections: (1) Taxonomy of pesticide use effects. (2) Economic production, in which competing

means of evaluating production effects are evaluated and the opportunity cost approach is maintained to be the only conceptually valid technique and superior to alternative cost analysis. (3) Human health, with identification of statistical methods of measuring health costs of pesticide use; emphasis is placed on costs of chronic illness, which are shown to measurable in both dollar and utility values. (4) Environmental effects, though not generally quantifiable in a benefit-cost framework, are important in pesticide-use decision-making; effects on the terrestrial and aquatic environment are discussed. (5) Aesthetic effects, likewise not adequately quantifiable with present techniques, are evaluated using organism/effects matrices. (6) Distribution effects, which encompass pesticide effects when stratified by social, income, and international trade classifications. The output of opportunity cost analysis is consumer surplus, the proper measure of both economic and health effects associated with pesticide use. (Lynch-Wisconsin)
W78-09238

DATA ANALYSIS AND MODEL DEVELOPMENT FOR ECOSYSTEM MANAGEMENT AT LAKE GEORGE, N.Y.,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Electrical and Systems Engineering.
For primary bibliographic entry see Field 5C.
W78-09243

SOME PROBLEMS IN ANALYSING AND FORECASTING WATER DEMAND,
For primary bibliographic entry see Field 6D.
W78-09246

THE ANSWERS MODEL: A PLANNING TOOL FOR WATERSHED RESEARCH,
Arkansas Univ., Fayetteville. Dept. oof Agriculture Engineering.
For primary bibliographic entry see Field 2J.
W78-09257

6B. Evaluation Process

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
L. U. Jauregui.
Magazine of the International Water Resources Association, Vol. 2, No. 1, p 25-26, March, 1977.

Descriptors: *Water conservation, *Water supply, *Water resources, Water supply development, *Water demand, Water quality.

The demand on the world's finite water supply is growing daily, because of the increased population, the concentration of people in certain areas and the industrialization process. At the same time, the quality of water has deteriorated because of these factors. We must take care of our water supply. And to do that, we have to change our attitudes towards it. (Skogerboe-Colorado State)
W78-08916

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 1 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08931

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-08952

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 516, Price codes: A16 in paper copy, A01 in microfiche. Completion Report, April 1978, 370 p. OWRT C-5342(4240)(6).

Descriptors: *Urbanization, *New England, *Lakes, *Regional analysis, *Regional development, Lake basins, Economic impact, Social impact, Lake watersheds, Coordination, Regions, Institutions, Multiple-purpose projects, Management, Planning, Research priorities, Political aspects.

The collection of papers included in this third volume represents the major individual contributions by research team members to the study and the results of specific research components. Each paper covered a number of particular relationships within the scope and conceptual framework of the study, but only a few of the numerous relationships implicit in the study framework could be the subject of individual research efforts. Nevertheless, those few, in addition to the cummulative expertise, provided the foundation for the interdisciplinary team analysis as presented in Volume I and the shorter summary version, Volume II. These individual research papers represent only a fraction of each scientist's contribution to the regional study. The remaining contributions are integrated in the study report presented in Volume I. The individual research papers together with the methodological appendix on conceptual methods are published as a complement to the overall study. (See also W78-08953 and W78-08954)
W78-08955

SYMPOSIUM ON COASTAL ZONE MANAGEMENT, THE UNIVERSITY OF WEST FLORIDA.
University of West Florida, Pensacola.
Proceedings of symposium, held August 8-9, 1976, Pensacola, Florida, by the University of West Florida, Pensacola, Florida, 1977. 80 p.

Descriptors: *Florida, *Coasts, Geology, *Management, Coastal plains, Conferences, Ecology, Economic impact, Environmental effects, Erosion, Estuaries, Legal aspects, Planning, Oil, Resources development, Resources, Shores, Social aspects, Water law.

The coastal areas have always been a source of sustenance for the human community. The magnitude of the mutual impact of the coastal zone and humanity, while great in the past, is increasing rapidly. The management of the coastal zone is becoming an activity of great human concern. Perhaps the most pronounced demand for such management is a result of the conflict between human requirements for stability in the coastal zone and the natural dynamics of coasts. Beaches move and hotels do not. Beaches are permanently eroded because they are not replenished as they would be naturally if the process of sand replacement had not been interrupted by the damning of rivers. Sand which would ordinarily replenish eroded beaches is trapped in inland reservoirs. Erosion and deposition are the two end effects of a single process; sediment transportation. Where a sand beach is marked by breaking waves sufficiently large to be of interest to tourists, one can be sure that the sand is geologically in motion. Onshore and offshore motion, at least at the present, represent losses to the system, and therefore, we can have serious erosion without compensating growth of land elsewhere. (Jordan-Florida)
W78-08985

FEDERAL EVALUATION OF RESOURCE INVESTMENTS: A CASE STUDY,
Cornell Univ., Ithaca, NY. Water Resources and Marine Sciences Research Center.
R. J. Kalter, L. W. Libby, R. C. Hinman, D. A. Schultz, and L. A. Shabman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 788, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Water Resources Council, Washington, D.C., February 1970. 89 p, 20 tab, append.

Descriptors: *Methodology, *Measurement, *Alternative planning, *Evaluation, *Cost-benefit analysis, Project planning, Project benefits, Cost analysis, Economic efficiency, Regional development, Environmental effects, Testing procedures, Land use, Decision making, Water resources development, Multiple purpose projects, *West Virginia, *Stonewall Jackson Reservoir(WV), West Fork River(WV).

The study is designed to test the evaluation procedures proposed by the 'Report to the Water Resources Council by the Special Task Force--Procedures for Evaluation of Water and Related Land Resource Projects' (June 1969). The test's project area involves Stonewall Jackson Reservoir on the West Fork River in West Virginia. The specific concerns of this test are benefit and cost measurement and the formulation of alternatives. It was found that empirical implementation of the four components of the multi-dimensional social welfare function required major additions to existing methodology. In most cases, existing sources of data and needed subsidiary studies were inadequate for accurate application of the appropriate methodology. Broadening the framework of project analysis beyond national economic efficiency to include the additional criteria of regional development, social well being and environmental enhancement did not reduce the need for careful and conceptually sound evaluation of the traditional efficiency impacts. With respect to the formation of alternatives for evaluation, it was found that the Special Task Force Report had not presented a means whereby alternatives can be limited, choices made, tradeoffs between each component highlighted, and proper options retained. Evaluative techniques that would eliminate these problems are recommended. (Nessa-NC)
W78-09062

TOWARD ENVIRONMENTAL DEMAND MANAGEMENT,
Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6G.
W78-09064

WATER ASSESSMENT (75) -- PLAN OF STUDY.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-09065

MICROMANPOWER PLANNING IN THE PUBLIC SECTOR,
J. K. Davies, and C. Wright.
Available from the National Technical Information Service, Springfield, VA 22161 as HRP-0009009, Price codes: A99 in paper copy, A01 in microfiche. Prepared for Office of Water Programs Operations, Environmental Protection Agency, HRP-0009009, 1974. 68-01-2242.

Descriptors: *Planning, *Manpower, *Human resources, *Personnel management, Institutions, Labor unions, Theoretical analysis, Data collections, Data processing, Data storage and retrieval, Economics, Employment, *Micromanpower planning, *Public sector, *Labor market, Collective bargaining, Plan implementation.

The purpose of this report is to establish a systematic method for doing the type of manpower planning that is often required of organizations within the public sector of the economy. Both the institutional and technical aspects of manpower planning are developed, the level of development having been determined by presumed constraints. First presented is an overview of manpower planning, followed by a typology and history of the field. Next discussed is the institutional background with which the effective micromanpower planner must be familiar. Included here are an examination of the labor market; details of this country's human resource development system--specifically covering manpower training, personnel administration and human engineering; and a review of the expanding role of labor unions and collective bargaining in the public sector and their relationship to the manpower planner. As the report moves to its coverage of specifics of the micromanpower planning field, a review first of general planning theory and then, more narrowly, manpower planning theory, is provided. Next developed are the specifics of a system of manpower planning in the public sector. Included here is a data system outline, data use in the identification and analysis of manpower planning programs and quality control. Finally, several issues relating to the implementation of a manpower planning system within a public sector organization are discussed. (Zayac-NC)
W78-09071

MANAGEMENT OF FLOODING IN A FULLY-DEVELOPED LOW-COST HOUSING NEIGHBORHOOD,
Halff (Albert H.) Associates, Inc., Dallas, TX.
For primary bibliographic entry see Field 6F.
W78-09178

HYDROELECTRIC POWER AND SCENIC PROVISIONS OF THE 1950 NIAGARA TREATY,
Waterloo Univ., (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 6E.
W78-09180

AN UNUSUAL CHALLENGE--AMERICAN RIVER PARKWAY,
Sacramento County Dept. of Parks and Recreation, CA.
D. H. Nance, and W. S. Ueda.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. UP1, p 103-115, July 1977. 3 fig, 9 ref.

Descriptors: *Rivers, *Parkways, *Recreation facilities, *California, *Conservation, *Urban highways, Social needs, Planning, Conflicts, Land use.

A 23-mile (37-km) natural river with its flood plain meandering through the urban area of Sacramento County in California poses a challenge to the planning, design, and management concepts for recreational development. Balancing the conflicting recreational demands with conservation of natural values, preservation of wildlife, protection of property rights, ecological balance, and jurisdictional coordination is no small task. A description of the American River Parkway, its resources, and its uses shows why there are conflicts in utilizing the valuable resources. The attempts to resolve the many conflicts and the evolution of parkway development are discussed. (Bell-Cornell)
W78-09184

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09188

ECONOMIC BENEFITS OF CLIMATOLOGICAL SERVICES,
World Health Organization, Geneva (Switzerland).
R. Berggren.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-24847, Price codes: A04 in paper copy, A01 in microfiche. Technical Note No. 145, 1975. 43 p, 48 ref.

Descriptors: *Climatology, *Climatic data, *Economics, *Cost-benefit analysis, *Meteorology, *Planning, World Meteorological Organization, United Nations, Weather modification, Forecasting, Land use, Agriculture, Forestry, City planning, Transportation, Engineering, Water supply, Recreation, Insurance Architecture.

Economic benefits of climatological services are discussed for: (1) land-use planning, (2) agriculture and forestry, (3) city planning, (4) building design, (5) transportation, (6) engineering, (7) water supplies, (8) commerce, (9) insurance, (10) recreationa and sports, (11) medical and health services, and (12) weather modification. Climatological information usually affects capital investment, while synoptic forecast information often only pertains to operational costs. Studies of economic benefits must distinguish between highly developed and developing countries. In advanced countries meteorological progress keeps pace with industrial progress while agriculture has already assumed its main lines of development; meteorology thereby becomes a matter of protection against calamities. In developing countries meteorology often contributes to development by demonstrating the best use of natural resources, especially in the agricultural sector. Climatic forecasts are strongly dependent on the stability of observation records. Climatological data on water supplies are important to city planning, agriculture, and industry, and are needed not only on relative distribution of rainfall, but also on absolute values. Precipitation and evaporation data are important in computing irrigation need, planning dam construction and city water supply, and assessing the introduction of new crops. (Lynch-Wisconsin)
W78-09226

RAINBOW TROUT FARMING: AN ECONOMIC PERSPECTIVE,
Fisheries and Marine Service, Winnipeg (Manitoba). Western Region.
D. M. Cauvin, and P. C. Thompson.
Fisheries and Marine Service Industry Report No. 93, November 1977. 24 p, 7 fig, 12 tab, 9 ref.

Descriptors: *Rainbow trout, *Fish farming, *Aquiculture, *Economic feasibility, *Lake 106(Manitoba Canada), Alberta(Canada), Manitoba(Canada), Saskatchewan(Canada), Economics, Lakes, Pothole lakes, Oxygen depletion, Winterkilling, Risks, Cost analysis, Algae, Eutrophication, Fish stocking, Fish management, Fingerlings, Costs.

Analysis of the economic feasibility of rainbow trout farming in western Canada's pothole lakes shows that prospects are favorable in Lake 106, a low-risk algal summerkill lake, but in non-algal-collapse lakes investment as a commercial venture is not recommended. Extensive aquaculture in prairie pothole lakes in western Canada, a relatively new venture, is characterized by a high entrepreneur turnover rate, and risk of financial failure is high due to variability in recovery rates of stocked fingerlinds. This study, through detailed analysis of Lake 106 in 1974-75, examines: (1) annual income and expenditures, (2) the break-even point on annual production, (3) the break-even point on production per unit of fishing effort, (4) investment, and (5) prospects for a fish-farming industry. Lake 106, eight km south of Erickson, Manitoba, is a typical winterkill lake. Fingerlings of 6.4-7.6 cm are stocked soon after break-up in early spring and harvested in October and November. The pothole lakes are extremely productive due to abundance of natural food, primarily freshwater shrimp (Gammarus lacustris). Fish growth is remarkable, reaching 25.4-35.6 cm during the six-month period. During winter unharvested fish are killed by oxygen depletion following ice formation; potential predators are thus eliminated. In Lake 106 fish recovery was 79% in 1974 and 64% in 1975; the break-even points were 42% and 44%, respectively. (Lynch-Wisconsin)
W78-09227

A FORMAT FOR PLANNING A COMMECIAL MODEL AQUACULTURE FACILITY,
Kramer, Chin and Mayo, Inc., Seattle, WA.
R. D. Mayo.
Northeast Fish and Wildlife Conference, February 25-28, 1974, Great Gorge, New Jersey. Technical Reprint No. 30, February 1974. 15 p, 16 fig.

Descriptors: *Aquaculture, *Planning, *Model studies, *Fish hatcheries, Facilities, *Economic feasibility, Fish farming, Commercial fish, Economics, Thermal powerplants, Metabolites, Heated water, Costs.

A method for planning a hypothetical fish hatchery and evaluating its economic feasibility uses for illustration the fictitious 'omegafish.' The imaginery hatchery, located on a river next to a thermal power plant, has a capacity of two million lbs/yr, 20% of the total market of 10 million lbs/yr. Market price is $1/lb. Water is pumped from the thermal plant/s discharge canal, for which the hatchery must pay $50,000/yr. Power can be purchased at $0.2/KWH. Regulations specify that the aquacultural facility not return water to the river which would increase natural river BOD (in ppm) by more than 20% under any flow condition. Feed and growth requirements of the fish are discussed. Flow patterns are needed which keep feed pellets moving aong the bottom of the rearing tanks at 0.4-0.7 ft/sec. The units may be made of concrete or other durable, cleanable material. Oxygen and water requirements, metabolite production, diseases, temperature/development relationships, genetic selection, mobility, and mortality are analyzed. Typical water pretreatment, reconditioning, and posttreatment processes are listed. A schematic layout of a facility is illustrated, and costs of labor, equipment, building, pollution control, and operation are itemized. (Lynch-Wisconsin)
W78-09228

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA, (PHASE I).
Mathematical Sciences Northwest, Inc., Bellevue, WA.; and Human Resources Planning Inst., Seattle, WA.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 705, Price codes: A19 in paper copy, A01 in microfiche. Report to Bureau of Land Management, Wash. DC., Final Report No. BLM-SE-77-02, Oct. 1976, 406 p, 55 fig, 112 tab, 63 ref. MSNW-HRPI-76-274, 08550-CT6-46.

Descriptors: *Alaska, *Natural gas, *Oil industry, *Kenai-Cook Inlet(AK), *Model studies, *Economic impact, *Social aspects, Offshore platforms, Oil, Economics, Cost-benefit analysis, Regional analysis, Land use, Demography, Kenai(Ak), Soldotna(AK), Forecasting, Simulation analysis, Employment, Economic development, Projections.

Phase I of this study centers on economic modelling of hydrocarbon development in Alaska's Kenai-Cook Inlet region, and Phase II concerns application of the modelling techniques to future development areas. In Phase I linkages of the petroleum sector to the rest of the Alaskan economy are examined. Kenai's proximity to Anchorage encourages the regions's economic integration with the rest of the state, and results in dispersion of the impact of development. The study includes: (1) a chronology of hydrocarbon development and employment from 1961-72; (2) economic analysis, with development and application of economic models; and (3) social analysis involving demographic trends 1961-72, community infrastructure and public services, social capital, and land use changes 1950-70. Emphasis is on the cities of Kenai and Soldotna as prime impact areas. Two Kenai-specific models, an economic base model and an input-output model, are used to forecast various economic and demographic variables. The economic base model is a modified version of a state base model developed for employment effects of pipeline construction. In test use the model successfully reproduced employment and population patterns reported for Kenai. For the social analysis, community interviews supplemented objective parameters. (See also W78-02517) (Lynch-Wisconsin)
W78-09229

MARITIME SUBSIDIES: PROBLEMS, ALTERNATIVES, AND TRADEOFFS,
New Mexico Univ., Alburquerque.
R. C. Moyer.
The Journal of Industrial Economics, Vol. 26, No. 1, p 53-68, September 1977. 1 fig, 5 tab, 11 ref.

Descriptors: *Merchant Marine Act, *Subsidies, *Trade-offs, *Shipping, *Maritime subsidies, Ships, Economics, Justification, Sealift Procurement and National Security study, Model studies, Simulation analysis, Financing.

Granting of operating subsidies to general cargo vessel operators are justified because military and strategic cargo-carrying capacity is essential for defense needs, but traditional economic-political justifications are rejected. In the case of construction differential subsidies, no such justification is found; a case is made for permitting U.S. flag operators to buy their vessels on the world market at the most competitive price. Suggestions are made for improving the foreign cost parity system of operating subsidies; the latter, based only on a proportion of total costs (excluding capital costs) and completely omitting revenues, leads to perverse results. A rate-of-return-based system of subsidy is proposed, and its advantages over the current system enumerated. A financial simulation model is used to compare the total financial value of U.S. subsidy, tax, and financing benefits with those for a similar vessel built and operated abroad, and it is shown that the U.S. package may be far more attractive than generally believed for certain bulk operators. Various mixes of financing and construction subsidies may shift the cost burden more toward the final consumer and away from the general body of taxpayers. A thorough reevaluation of the objectives and rationales of the new maritime program begun in 1970 is clearly needed. (Lynch-Wisconsin)
W78-09230

AN ECONOMIC APPRAISAL OF EASTERN SHORE SEAFOOD HARVESTING,
Virginia Inst. of Marine Science, Gloucester Point.
I. Strand.
Marine Resources Advisory, No. 11, June 1976. 6 p, 6 fig, 4 tab, 4 ref.

Descriptors: *Virginia, *Eastern Shore(VA), *Economics, *Commercial fishing, *Chesapeake Bay, *Fisheries, Seafood, Commercial fish, Clams, Oysters, Crabs, Flounder, Striped bass, Sea trout, Bluefish, Atlantic Ocean, Bays, Oceans.

Short- and long-term trends in the seafood harvesting industry of Virginia's Eastern Shore are analyzed using 1972-74 monthly data and 1949-72 annual data. Principal products are clams, hard and soft blue crabs, oysters, and several finfish, including fluke (flounder), striped bass, sea trout, and bluefish. In shellfish production there have been sharp long-term declines in soft crabs and oysters. Soft crab decline may be due to increased wages and disappearance of Chesapeake eel grass, while the decline in oyster production may be the result of MSX disease, increased salinity, and labor costs. Variation in finfish production has been dramatic. Croaker landings between 1949-62 peaked at 1.4 million lbs and never fell as low as 175,000 lbs, but between 1963-70 landings never exceeded 30,000 lbs and fell as low as 100 lbs. Puffers never exceeded 210,000 lbs from 1949-62, but rose to 1.5 million lbs in 1065. Causes have not been established. The value of 11 major commercial shellfish and finfish species on the Eastern Shore totalled $4.2 in 1972, $6.8 million in 1973, and $9.2 million in 1974. Various aspects of commercial fishing accounts for about 25% of Virginia employment. Recent federal government actions will probably cause a severe cost-price squeeze in the shellfish industry, and prices will continue to decline. Competition for labor should cause wage increases. Effects will be farless severe on the finfish industry. (Lynch-Wisconsin)
W78-09231

ECONOMIC AND SOCIAL PURPOSES RELATED TO WATER MANAGEMENT,
Organization for Economic Co-operation and Development, Paris (France).
W. Wright.
Publication No. 22.408, June 1977. 50 p, 90 ref.

Descriptors: *Water management(Applied), *Social aspects, *Economics, *Regional development, *Organization for Economic Cooperation and Development(OECD), *Planning, Legal aspects, Goals, Research priorities, Equity, Political aspects, Social values, Cost-benefit analysis, Governments, Recreation, Aesthetics, Water demand, Water supply.

Economic and social goals which govern water management in member nations of the Organization for Economic Cooperation and Development (OECD) were ascertained, and problems of implementation identified. Six objectives common to various countries are: (1) equity, (2) economic efficiency, (3) regional development, (4) environmental quality improvement, (5) cooperation with local administrations, and (6) cooperation with water authorities of other countries. Problems which have arisen during planning and implementation include: (1) equity problems regarding impact and financing of specific projects and current changes in laws; (2) economic efficiency is undercut by lack of economic information and mechanisms for motivating decision-makers to take social costs and benefits into account; (3) regional development programs have lead to resource misallocation by subsidizing such special uses as irrigation; (4) cost-benefit studies for measuring environmental quality improvements suffer from difficulties in evaluating intangible costs and benefits; and (5) national and international cooperation is needed to coordinate political and hydrological management units. Research is needed on effects of government subsidies, demand forecasts based on prices, recreational and aesthetic benefits of water projects, costs and benefits of research programs, and water utilization rights. (Lynch-Wisconsin)
W78-09237

TWO OIL SPILLS - INTERRELATEDNESS OF SOCIOECONOMIC STRUCTURE AND IMPACT ON SEAFOOD MARKETING SYSTEM,
Swedish Water and Air Pollution Research Inst., Stockholm.
For primary bibliographic entry see Field 5C.
W78-09244

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
Report No. 37, Papers of a Symposoum Held in Melbourne, Victoria, August, 1972, December 1972.

Descriptors: *Watershed management, *Watersheds(Basins), *Recreation demand, *Reservoirs, *Australia, *Victoria(Australia), *Water management(Applied), *Melbourne(Australia), *Water resources development, Water supply, Land use, Administration, Water storage, Recreation facilities, Tourism, Water policy, Forest watersheds, Planning, Multiple purpose, Single purpose.

Five papers from a symposium on recreational aspects of watershed management held in August 1972 in Melbourne, Australia focus on problems of that part of the country: (1) 'Catchment Management and Use'--discusses the water cycle, water shed management objectives, responsible agencies in Australia, and effects of recreational activities. (2) 'Recreational Use of Inland Waters in Victoria'--describes the rapid growth of recreational development at irrigation storage reservoirs since 1950 in Victoria, administrative mechanisms devised, and planning strategy. (3) 'Water Supply Policies and Studies for Metropolitan Melbourne'--deals with the policy of single-purpose watershed use ('closed catchment') of the Melbourne and Metropolitan Board of Works, and describes the Board's programs of fire prevention and suppression, hydrology research, and recreation reserves. (4) 'Use of Catchment Areas as Flora and Fauna Reserves'--discusses factors which affect development of wildlife reserves in water supply catchments in Victoria, including the controlling agency's policies, forestry, grazing, snow sports, and motorized recreational vehicles. (5) 'Recreation Evaluation as a Guide of Policy Making in Water Catchments'--presents a method of evaluating economic benefits of recreational use, using data from the Grampians ranges in Victoria; an aggregate demand curve is derived. (See W78-09248 thru W78-09252) (Lynch-Wisconsin)
W78-09247

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE,
R. G. Downes.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p. 1.1-1.6, December 1972.

Descriptors: *Watersheds(Basins), *Watershed management, *Australia, *Water supply, *Water management(Applied), Land use, Hydrologic cycle, Permeability, Water pollution sources, Recreation, Governments, Water sources, Administration, Water storage, Sedimentation, Turbidity, Legislation, Agricultural runoff, Pollutants.

Various aspects of watershed management-especially in Australia--are discussed, including a brief

description of the water cycle, management objectives, agencies responsible, and effects of recreational activities. For ideal catchments with uniform flow and volume high enough to permit minimum storage, the primary management objective is to protect the regular flow. For catchments with irregular flow which require storage, an important management objective is prevention of soil erosion and consequent sediment deposition in reservoirs, thus maintaining the storage capacity. The main pollutants of water supply sources are generally sediment and turbidity from soil erosion (Particularly in the U.S.), and in Australia salinity, and leached fertilizers, pesticides, and organic matter from agriculture. Insustrial and toxic wastes and litter are not usually significant pollution sources in water supplies. The greatest potential pollution source is increased residence by people using the watershed for recreation; recreational access carries with it creation of less permeable surfaces and sewage effluent. The Land Conservation Council, created in 1970, makes recommendations to, and advises the Soil Conservation Authority on, catchment matters. The authority has followed a policy of enabling multiple-purpose use while maintaining catchment efficiency. (See also W78-09247) (Lynch-Wisconsin)
W78-09248

RECREATIONAL USE OF INLAND WATERS IN VICTORIA,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
G. W. Lewis, and R. Bird.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, 2.1-2.11, December 1972. 2 append.

Descriptors: *Victoria(Australia), *Australia, *Recreation, *Reservoirs, *Water storage, *Planning, Water supply, Recreation demand, Recreation facilities, Irrigation, Administration, Water resources development, Water management(Applied), Sport fishing, Boating, Swimming, Tourism, Water policy.

Recreational development of irrigation storage reservoirs in Victoria, Australia, has largely taken place since 1950 as a result of affluence, rising boating popularity, and availability of an increasing number of reservoirs. Funds were first specifically budgeted for capital expenditures on recreational works in 1963-64 ($26,000) for use by the State Rivers and Water Supply Commission; in 1970-71 $117,300 was allotted. Additional grants from the Ministry of Tourism over the past eight years have amounted to 50% of the commission's own allocation, and total capital expenditures have exceeded $750,000. The rapid increase in recreational responsibilities has strained the commission because of problems of staff, funding, and experience. Problems included litter, policing, and provision of facilities. In the early 1960s the commission created a Reservoir Recreational Facilities Committee to plan for all storages, based on separate facilities for day picnickers and for boaters and campers. Though the program has been successful, separation of the two types of facilities has resulted in duplication of many services, such as roads, parking lots, and restrooms. A 1964 amendment to the Water Act allowed the commission to constitute its lands as recreational areas, with revenues generated retained for further development. (See also W78-09247) (Lynch-Wisconsin)
W78-09249

WATER SUPPLY CATCHMENT POLICIES AND STUDIES FOR METROPOLITAN MELBOURNE,
B. H. Fryer.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p 3.1-3.8, December 1972. 4 fig.

Descriptors: *Melbourne(Australia), *Water policy, *Watershed management, *Water supply, *Forest watersheds, *Watersheds(Basins), *Water management(Applied), City planning, Recreation demand, Hydrology, Research and development, Forest fires, Fire prevention, Planning, Closed catchment policy, Single purpose, Forest management, Melbourne and Metropolitan Board of Works.

The Melbourne and Metropolitan Board of Works (Australia), constituted in 1890 to orperate the city's water supply system, has consistently followed a 'closed catchment' or single-purpose water use policy for the catchment area. Present catchment areas total 230,000 acres of unalienated forested land. Despite frequent challenges to the policy by citizens, government agencies, and business associations, the board contends it should continue the policy, which has yielded acceptable results at minimal cost for almost a century. Public entry to the watershed areas is denied principally because Melbourne's system is based on an essentially untreated water supply. Nevertheless, the watersheds do carry significant quantities of commercial timber and are located near a rapidly expanding population seeking recreational opportunities. The board's watershed management program reflects these consideration in three broad aspects: (1) fire prevention and suppression, (2) applied research into forested catchment hydrology, and (3) development and maintenance of public recreation reserves outside the catchment. The board maintains a 200-man fire-fighting team, and operates four fire lookout towers and a communications system. In the hydrology research program, precipitation, throughfall, soil moisture, streamflow, and water quality are under study in three catchments--Picaninny, Blue Jacket, and Slip--to determine the feasibility of permitting commercial timbering. (See also W78-09247) (Lynch-Wisconsin)
W78-09250

THE USE OF CATCHMENT AREAS AS FLORA AND FAUNA RESERVES,
National Parks, Victoria (Australia).
For primary bibliographic entry see Field 6G.
W78-09251

RECREATION EVALUATION AS A GUIDE TO POLICY MAKING IN WATER CATCHMENT,
P. Greig.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p 5.11, December 1972. 5 fig, 6 tab, 2 ref.

Descriptors: *Grampians ranges(Australia), *Mountain forests, *Recreation demand, *Watershed management, *Economics, Victoria(Australia), Watersheds(Basins), Mountains, Water supply, Forestry, Tourism, Surveys, Social aspects, Pricing, Planning, Decision-making, Methodology, Cost-benefit analysis, Camping.

A method for evaluating economic benefits of recreational usage is described and demonstrated for Australia's Grampians ranges, a forested, mountainous water catchment area located between Melbourne and Adelaide in Victoria. Utilization of the results in management decision-making is illustrated. The method was initially developed by Clawson (1959). A survey was conducted over a 12-month period of visitors to the Grampians, and involved personal interviews, questionnaires, and vehicle cunts. Information was grouped according to post code into 132 zones of origin, and average round-trip travel costs were calculated for each zone from average road mileage and an average of $.04 cost permile of travel. Average non-travel costs (food, accommodations) were also calculated and added to travel costs to estimate average trip costs; the total was used as a proxy for average price paid per carload of visitors from each zone. Numbers of visitors per thousand of base population was also measured. The aggregate demand curve was plotted for the 'whole outdoor recreation experience.' Successive changes in demand brought about by application of different admission fees were estimated. Aggregate consumer surplus (the amount of money a consumer would pay over actual price) was derived from the demand curve. As there is currently no admission price, total annual consumer surplus is $323,450. Results are applied to planning for camping facilities in the Grampians. (See also W78-09247) (Lynch-Wisconsin)
W78-09252

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFECT OF PROCESS MODIFICATIONS ON THE REDUCTION OF WATER USE AND WASTE IN A CASE STUDY DAIRY PLANT,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 3E.
W78-08890

IRRIGATION COSTS, WHICH METHOD IS BEST FOR YOU.
For primary bibliographic entry see Field 3F.
W78-08917

ANALYSIS OF COSTS OF POLLUTION CONTROL.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09232

IMPLEMENTATION OF POLLUTION CHARGES.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09233

NOTE ON THE IMPLEMENTATION OF THE POLLUTER-PAYS PRINCIPLE.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09234

SURVEY OF POLLUTION CONTROL COST ESTIMATES MADE IN MEMBER COUNTRIES.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-09236

6D. Water Demand

WATER--A CRISIS MORE SERIOUS THAN ENERGY,
United Nations Center for Economic and Social Information, New York.
For primary bibliographic entry see Field 6B.
W78-08916

PROCEEDINGS ON CONFERENCE ON GEOTHERMAL ENERGY AND THE LAW HELD IN SANTA BARBARA, CALIFORNIA ON FEBRUARY 3, 4 AND 5, 1975.
For primary bibliographic entry see Field 6E.
W78-08991

SOME PROBLEMS IN ANALYSING AND FORECASTING WATER DEMAND,
A. C. Twort.
Water Services, Vol. 80, No. 970, p 751-752, December 1976. 1 tab, 4 ref.

Descriptors: *Water demand, *Forecasting, *Water management(Applied), *Water consumption(Except consumptive use), *Domestic water, Water supply, Water users, United Kingdom, Classification, Planning, Data collections.

Although all water demand forecasting is based on past consumption records, most such records are unreliable because of nonuniform consumption classifications and because parameters used in defining types of consumption are not generally described. A practical classification system for water consumption is presented with three broad categories: (1) Household--domestic purposes (including car washing), gardening, wasteful use, and leakage. (2) Commercial/industrial/agricultural--shops and offices, large industrial, other industrial, institutional and public gardens, and agricultural and horticultural. (3) Unaccounted-for--leaks on service pipe connections to mains and at distribution mains, overflows and leaks from reservoirs, and three types of meter errors. In Britain hotels and licensed premises have sometimes been included under domestic consumption, while in other countries they would be placed under commercial. 'Household consumption' is therefore preferable to 'domestic consumption.' Reliable measurements of household consumption are rare, and are usually given only for relatively small sample populations. Such measurements must exclude distribution mains leakage and leakage from service pipe connections to mains, the resident population served must be known with at least + or - 5% accuracy, and households in the survey must comprise a definable class. Random sampling must not be used where there is more than one class of property. Better information on losses is also needed to accurately determine achievable targets. (Lynch-Wisconsin)
W78-09246

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE - PROCEEDINGS.
Water Research Foundation of Australia, Sidney.
For primary bibliographic entry see Field 6B.
W78-09247

WATER CATCHMENT MANAGEMENT AND RECREATIONAL USE,
For primary bibliographic entry see Field 6B.
W78-09248

RECREATIONAL USE OF INLAND WATERS IN VICTORIA,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 6B.
W78-09249

RECREATION EVALUATION AS A GUIDE TO POLICY MAKING IN WATER CATCHMENT,
For primary bibliographic entry see Field 6B.
W78-09252

6E. Water Law and Institutions

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME I,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08953

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES: AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME II,
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 4C.
W78-08954

THE IMPACT OF URBANIZATION ON NEW ENGLAND LAKES, AN EXPERIMENT IN REGIONAL INTERDISCIPLINARY RESEARCH TO ASSIST LAKE MANAGEMENT EFFORTS, VOLUME 3, SELECTED TECHNICAL PAPERS.
New England Council of Water Center Directors, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-08955

LAND ACCRETION AND AVULSION: THE BATTLE OF BLACKBIRD BEND,
L. S. Camp.
Nebraska Law Review, Vol. 56, No. 4, p 814-835 (1977).

Descriptors: *Nebraska, *Iowa, *Accretion(Legal aspects), *River flow, Missouri River, Boundaries(Property), Boundary disputes, Indian reservations, Judicial decisions, Riparian land, Avulsion, Rivers.

The Missouri River has washed away a peninsula on the Nebraska side that was part of a reservation given to the Omaha Indian Tribe by an 1854 treaty with the United States. This resulted in a spate of litigation in 1975 over 11,000 acres of land in Iowa which the Indian Tribe claimed for itself. The author focuses on various legal principles related to river movement. There is particular emphasis upon Nebraska and Iowa law. The above situation is used to illustrate these legal principles. The United States District Courts' resolution of this specific case is analyzed in detail. The author concludes with an exploration of the policies underlying the ruler of accretion and avulsion. Also included is a proposal for the recognition of an effective form of adverse possession against the government. Althugh the rechanneling of the Missouri and Mississippi Rivers tends to preclude further land disputes, the great number of rivers, streams and creeks coupled with the increasing value of farmland promises future disputes over smaller portions of land. The author notes that there are remaining issues not considered by the court in the present case which need to be resolved. (Quarles-Florida)
W78-08968

FEDERAL PROTECTION OF INSTREAM VALUES,
L. Holdeman.
Nebraska Law Review, Vol. 57, No. 2, p 368-402 (1978).

Descriptors: *Federal government, *Water policy, *Water utilization, *Federal Water Pollution Control Act, Recreation, Water quality, Planning, Water rights, Legislation, Permits, Water resources, Regulation.

The federal goverment has expressed strong concern for environmental and recreational values. These concerns encompass preservation of water quantity and quality, as well as fish and wildlife resources. Increasingly the federal government has become more involved in instream use, planning and preservation. Although state governments have traditionally controlled the acquisition and retention of water use rights, the federal government has intervened where states have failed to protect resources and where the interest to be protected is federal in nature. State inaction remains a serious obstacle to the protection and preservation of instream values. This obstacle is explored in detail. The diversion requirement for valid appropriation is cited as being totally inconsistent with conservation. Other methods employed by states in the regulation and adjudication of water rights are also examined. The primary focus of the author is on the federal prerogative in protecting instream values. Underlying principles are explored as well as the exercise of present and future federal control. The author notes an increasing awareness of environmental values by the federal government. (Quarles-Florida)
W78-08969

OIL SPILL IN BERMUDA: A CASE STUDY OF EFFECTIVE LITIGATION,
Harvard Univ., Cambridge, Div. of Applied Sciences. MA.
For primary bibliographic entry see Field 5G.
W78-08970

CORPS' WETLANDS CONTROL SURVIVES TRIP THROUGH A LEGISLATIVE SWAMP,
J. D. Kirschten.
National Journal, No. 43, p 1506-1512 (October 23, 1976).

Descriptors: *Dredging, *Interagency cooperation, *Permits, *Wetlands, Federal Water Pollution Control Act, Administrative agencies, Agriculture, Construction, Legislation, Marshes, Water policy, Political aspects.

A far-reaching and surprisingly resilient Army Corps of Engineers program to protect the nations' diminishing wetlands emerged unscathed at the close of the 94th Congress despite a withering election-year attack by powerful and varied groups of opponents. Environmentalists are generally satisfied with the turn of events that has left the Corps with broad authority to require permits for the disposal of dredge or fill materials in waters and wetland areas. Decisions on the issuance of permits must be made in accordance with Environmental Protection Agency (EPA) guidelines, and EPA has the authority to veto disposal sites it deems environmentally unsuitable. While the current program serves as an effective stopgap solution, providing a procedural basis for examining activities that might endanger wetlands resources, it has many pitfalls as a long-term program. It fails to accomodate the interests of states and localities and it is not coordinated with other federal efforts concerning coastal zone management or other programs. There remains an influential constituency of farm, forestry, construction, and land development interests working hard to dismantle the program. (Jordan-Florida)
W78-08971

CORPS CONFIRMS POLICY AGAINST 'UNNECESSARY' DEVELOPMENT IN WETLANDS.
Environmental Law Reporter, Vol. 6, No. 6, p 10117-10119 (June, 1976).

Descriptors: *Wetlands, *Florida, *Permits, *Dredging, Mangrove swamps, Federal Water Pollution Control Act, Water resources, Administrative agencies, Administrative decisions, Legal aspects, Water resources, Water law, Competing uses, Legislation, Water policy, State governments, Decision making, Cost-benefit analysis.

In accordance with the Federal Water Pollution Control Act Amendment of 1972, the Army Corps of Engineers has denied two applications from a large land and housing construction developer for dredging and filling more than 2000 acres of mangrove swamps in Florida. Section 404 of the Act extended the Corps' jurisdiction over dredge and fill activities to all waters of the United States. The application of this section has signalled the Corps' willingness to implement its newfound policy of protecting the nation's wetlands from unnecessary destruction. The Corps, noting that mangroves perform a number of important functions, including ocean food chain production and acting as wave and erosion buffers, applied a two-pronged

test. Since the benefits of the dredging and filling did not outweigh the damage to the wetlands resource and since the proposed alteration of the wetlands was not proven to be necessary to realize these benefits, the applications were denied. The denial of the proposed fill projects serve as notice to other developers that a strong presumption exists against the granting of further dredge and fill permits for the construction of housing in productive wetland areas. (Curtis-Florida)
W78-08972

OUR SALTY RIVERS: LEGAL AND INSTITUTIONAL APPROACHES TO SALINITY MANAGEMENT,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
Land and Water Law Review, Vol. 13, No. 2, p 441-464 (1978).

Descriptors: *Water pollution control, *Salinity, *Management, *River basins, *Systems analysis, Pollution abatement, Groundwater, Surface water, Water law, Rivers, River regulation, Water rights, Federal Water Pollution Control Act, Colorado River, Agriculture, Industries, Saline water, Planning, Local governments, Federal government.

The salinity problem in United States rivers and elsewhere worsens annually and no water law system developed to date adequately addresses salinity management. The author discusses the salinity problem, its scope and remedial and preventative measures taken to date. Because the sources of salinity are so widely scattered and diffused, impacting both interstate and international rivers, effective solutions must be regional, national or even international in scope. The federal government must necessarily be involved in their design. There are no simple legal or institutional solutions to salinity problems. Noting that current pollution control programs are generally aimed at controlling point-sources and nonpoint salinity pollution sources, the author concludes that the specific relationship of the land, water, population, crop distribution and legal systems that exist in each basin will require uniquely tailored systems-analysis type solutions. The most efficient approach appears to call for an area's central government, or one of its agencies, to analyze the salinity problem, consider and select among the alternative solutions, and implement those selected by direct and authoritative governmental action. (Easterbrook-Florida)
W78-08973

PUBLIC RIGHTS TO PRIVATE BEACHES, LAKES, AND STREAMS IN WASHINGTON,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
In: Shorelines Management 1977 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Washington Sea Grant Program, Division of Marine Resources, University of Washington, Seattle, 98195, p 133-141.

Descriptors: *Washington, *Public rights, *Public access, *Water rights, *Riparian rights, Beaches, Lakes, Streams, Fishing, Zoning, Permits, Navigation, Oceans, Legislation, Recreation, Navigable waters, Non-navigable waters, Prescriptive rights, Legal aspects, Judicial decisions.

The trend of the law in Washington State has been toward recognition of a broader range of public rights in adjacent lands of both navigable and non-navigable waters. Various court doctrines along with legislation have brought about significant changes in this area. Washington law now provides that the public has the right to use navigable and non-navigable waters. No impediments to such use can be placed on those waters without approval of local, state, and national governments. Impeding structures that have been built in these waters may be removed without compensation if necessary to aid navigation. The public probably has the right to use all privately owned tidelands and dry sands areas on beaches for recreational purposes. This right may also apply to privately owned tidelands of the Straits of Juan de Fuca, Hood Canal and Puget Sound. This right of access extends to privately owned beds, gravel and sand bars of rivers. Riparians on non-navigable lakes and streams have a right to use the entire water surface, whether publicly or privately owned. No filling or building of non-water-dependant structures on these waters is permitted without obtaining permission from all other riparian owners. (Quarles-Florida)
W78-08974

GEOTHERMAL RESOURCES: WATER AND OTHER CONFLICTS ENCOUNTERED BY THE DEVELOPER,
Vranesh, Raisch, and Schroeder, Boulder, CO.
G. Vranesh, and J. D. Musick, Jr.
Land and Water Law Review, Vol. 13, No. 1, p 109-49, 1977.

Descriptors: *Thermal power, *Geothermal studies, Energy, *Natural resource, Prior appropriation, Thermal properties, Hydrologic systems, Thermal water, Geysers, Natural recharge, Subsurface water, Oil-water interfaces.

Geothermal resources described as an alternative energy source with the potential of helping the United States reach a goal of energy self-sufficiency, have not yet been fully exploited in this country. In this article, the authors explain the need for a legal definition of geothermal resouces as well as a clarification of the body of law that should be applied to its development. After a brief discussion of the basic nature of the resource, the authors describe the types of potential pollution that can result from geothermal development. Through analysis of recent federal and state legislation and case law, the article examines the current conflict over whether to classify geothermal energy as a mineral or as a water resource. A discussion of the current Colorado treatment of geothermal development further illustrates the disparity in regulation and ownership rights that results from this difference in classification. The authors conclude that since geothermal resources are interrelated with groundwater supplies, geothermal resources should be classified as 'water' and should be subjected to the appropriation doctrine now used by the Western states. (Anderson-Florida)
W78-08975

WATER THAT IS NOT WATER.
Utah Univ., Salt Lake City. Coll. of Law.
O. Olpin, and A. D. Tarlock.
Land and Water Law Review, Vol. 13, No. 2, p 391-440, 1978.

Descriptors: *Geothermal studies, *Thermal water, *Energy, *Water rights, Groundwater, Resources, Oil-water interfaces, Federal-state water rights conflicts, Reservation doctrine, Subsurface waters, Surface-groundwater relationships, Geysers, Mineral industry.

This article describes the relationship between geothermal resources and conventional sources of water in order to analyze the proper relationship between the law of geothermal development and western water law. The authors argue that a geothermal reservoir is simply a natural resource whose exploitation should be regulated so that the developer is forced to bear all of the environmental costs of exploitation. A survey of the current federal and state legislation and case law illustrates the existing conflict over which body of law-mineral or water-should govern the recognition of property rights in geothermal reservoirs. The authors then present an argument against the blanket application of western water law and instead propose a system whereby a government agency after determining the degree of interconnection between geothermal areas and freshwater sources, would impose conditions and limitations on geothermal development designed to prevent substantial harm to freshwater sources. Under the proposed system, any geothermal operator who complies with the prescribed conditions would have the benefit of a presumption that his operations cause no injury to or interference with freshwater sources in the absence of convincing evidence to the contrary. (Anderson-Florida)
W78-08976

THE EPA'S POWER TO ESTABLISH NATIONAL EFFLUENT LIMITATIONS FOR EXISTING WATER POLLUTION SOURCES.
For primary bibliographic entry see Field 5G.
W78-08977

ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCE PROJECTS: THE ARMY CORPS OF ENGINEERS,
For primary bibliographic entry see Field 6G.
W78-08978

REAL PROPERTY--STATE HAS TITLE TO FORESHORES OF GEORGIA'S NAVIGABLE WATERS,
D. Bergh.
Mercer Law Review, Vol. 27, No. 4, p 1229-1236 (Summer, 1976).

Descriptors: *Tidal waters, *Navigable waters, *Non-navigable waters, *Georgia, *Public lands, Tidal marshes, Recreation, Oysters, State governments, Coastal marshes, High water mark, Low water mark, Land tenure, Real property, Shores, Beaches, Legal aspects, Judicial decisions, Legal review, Water rights, Riparian rights.

The state of Georgia has fee simple title to the foreshores of all navigable tidewaters in the state. Although a minority of states extend private ownership down to the low water mark, Georgia, along with the majority of states, holds that ownership of the foreshore up to the high water mark is in the state. In the 1976 State v. Ashmore case, the Georgia supreme court held that it was not the intent of an early state constitutional commission or the state legislature to extend the titles of landowners adjacent to tidewaters to the low water mark. The court also held that the state had title to the foreshore of all navigable tidewaters, but noted the difference between navigable and non-navigable tidewaters. Although it declined to define non-navigable tidewaters, the court did caution that its ruling applied only to navigable tidewaters. The court also failed to address several other key issues: whether or not coastal marshlands are 'navigable' or 'non-navigable' tidewaters; and if the marshlands are considered non-navigable, whether their title, which is vested in the abutting landowners, applies to oyster beds, bottoms, or land. (Easterbrook-Florida)
W78-08979

OCS DEVELOPMENT AND THE CONSISTENCY PROVISIONS OF THE COASTAL ZONE MANAGEMENT ACT--A LEGAL AND POLICY ANALYSIS,
Department of the Interior, Washington, DC. Office of the Solicitor.
K. A. Shaffer.
Ohio Northern University Law Review, Vol. 4, No. 3, p. 595-623 (July, 1977).

Descriptors: *Continental shelf, *Permits, *Federal-state water rights conflicts, *Land management, *Coast, Leases, Federal government, California, Oil, State governments, Legislation, State jurisdiction, Energy, Water management(Applied), Federal jurisdiction, Governmen-

tal interrelations, Legal aspects, Judicial decisions, Environmental effects, Beds under water.

A conflict has arisen between outer continental shelf development and protection of the coastal zone environment. Exploitation of outer continental shelf oil and gas is considered to be the only realistic short-term source of energy pending development of alternative energy sources, such as solar energy. The author notes that clear policy guidance from Congress is needed to ensure a balance of developmental and environmental considerations. The author discusses why the Coastal Zone Management Act and amendments tend to hinder a balanced decision making process. The implications and ramifications of a lawsuit brought by Exxon involving development off California's coast are examined. The author remarks that since the courts have failed to resolve the policy conflicts, Congressional action is necessary. The author calls for a unitary policy that: (1) clearly sets forth policy directives which reflect a conscious choice of values implicit in those policy directives; (2) assures development of balanced decision-making; and (3) promotes federal-state cooperation. This last goal may be accomplished by delineating jurisdictional authority over outer continental shelf development and coastal zne management between federal and state agencies, and by centralizing development administration in one capable agency. (Quarles-Florida)
W78-08980

THE NEWFOUNDLAND OFFSHORE CLAIMS: INTERFACE OF CONSTITUTIONAL FEDERALISM AND INTERNATIONAL LAW,
Toronto Univ. (Ontario). Faculty of Law.
G. S. Swan.
McGill Law Journal, Vol 22, No 4, p 541-573 (Winter, 1976).

Descriptors: *Canada, *Federal-state water rights conflicts, *Continental Shelf, *International law, Territorial seas, Legal aspects, Judicial decisions, Legal review, Jurisdiction, Federal government, Water law, State jurisdiction, Federal jurisdiction, Governmental interrelations, Water policy, Ownership of beds, Beds under water, Constitutional law, Oceans, Oil fields, Foreign countries, History.

Soon after the discovery of petroleum beneath the Labrador Sea, conflict arose between Newfoundland and the Canadian Federal Government concerning jurisdiction over the continental shelf and the territorial sea. Both governments claim the offshore oil and gas. The Canadian problem is compared with Germany's, Mexico's, and other nations' treatment of federal-state offshore controversies. Australian legal developments are detailed for analogy. The possible impact of the 1958 Geneva Convention on the Continental Shelf is also considered. A case concerning British Columbia presents the Canadian Supreme Court's test for continental shelf jurisdiction; a province must show exercise of valid jurisdiction conferred prior to entry into the Confederation. To support an argument that Newfoundland meets the test, the author examines: (1) the 1949 Terms of Union uniting Newfoundland and Canada; (2) the British North American Acts of 1867 to 1946; (3) Newfoundland statutes and case law showing exercise of jurisdiction; and (4) Newfoundland's assertions of jurisdiction in the World Court. After distinguishing Canadian Supreme Court treatment of other coastal state's claims, the author concludes that as a matter of Canadian constitutional and international law, Newfoundland should prevail. (Hoofman-Florida)
W78-08981

AN ANALYSIS OF DEEP SEABED MINING LEGISLATION,
D. B. Ott.
Natural Resources Lawyer, Vol 10, No 3, p 591-604 (1977).

Descriptors: *Legislation, *Mining, *Law of the Sea, *Beds under water, Continental shelf, Mineral industry, Manganese, International water, United Nations, United States, Technology, Environment, Federal government, Treaties, Oceans, Federal jurisdiction, Regulation, Natural resources, Exploitation, Water law.

Deep seabed mining refers to the gathering of manganese nodules on the ocean floor beyond the continental shelf. These nodules contain exploitable amounts of nickel, copper, cobalt and manganese. The author discusses pending legislation intended to protect future investments of American mining companies who have developed the basic technology for deep seabed mining from the capriciousness of mining beyond the jurisdiction of any nation. The author analyzes pro and con arguments concerning two proposed bills, and contrasts the operation of each of the laws in relation to United States and international law. The Deep Seabed Hard Minerals Act would establish a licensing and regulatory system for American nationals interested in mining the seabed. The Ocean Mining Incentive Act is a compromise bill which would protect American mining companies without jeopardizing a Law of the Sea treaty. The mining industry fears the effect that a Law of the Sea treaty may have on their rights to mine the seabed. Presently no law expressly prohibits unilateral exploitation, although the United Nations has declared the resources of the deep seabed to be the common heritage of mankind. Congress must balance American and industry self-interest against the international considerations. (Quarles-Florida)
W78-08982

THAT GULF OF MAINE DISPUTE: CANADA AND THE UNITED STATES DELIMIT THE ATLANTIC CONTINENTAL SHELF,
G. S. Swan.
Natural Resources Lawyer, Vol 10, No 2, p 405-457 (1977).

Descriptors: *Boundaries(Surfaces), *Canada, *United States, *International law, *Boundary disputes, Gulfs, Continental shelf, Atlantic Ocean, Economics, International waters, Permits, Geologic control, United Nations, Exploration, Exploitation, Territorial seas, Judicial decisions, Jurisdiction, Ownership of beds, Oil.

The United States government holds the stronger position in the Atlantic continental shelf delimitation dispute with Canada. The dispute flared when Canada issued exploration permits in the Gulf of Maine. The author discusses the geographic and early 1976 diplomatic ambit of the problem. The contentions of both governments are set forth and their strong economic motives are revealed. There is a detailed discussion of the International Court of Justice's opinion in the North Sea Continental Shelf Cases. These cases are viewed to be instructive precedent for the analysis of the instant dispute. The concepts of equidistance and of special circumstances in North Sea continental shelf delimitation are considered important. These ideas as debated prior to the Geneva Convention on the Continental Shelf are reviewed. However, neither concept influenced the International Court of Justice in the North Sea controversy. The reasons for this as well as the actual basis of the case holding are examined. The author concludes that the North Sea Continental Shelf Cases, when read in the perspective of past debate, will give the United States a decided edge in any further adjudication. (Quarles-Florida)
W78-08983

A PROCEDURAL FRAMEWORK FOR IMPLEMENTING NONPOINT SOURCE WATER POLLUTION CONTROL IN IOWA.
For primary bibliographic entry see Field 5G.
W78-08984

SYMPOSIUM ON COASTAL ZONE MANAGEMENT, THE UNIVERSITY OF WEST FLORIDA.
University of West Florida, Pensacola.
For primary bibliographic entry see Field 6B.
W78-08985

FLORIDA REGIONAL COASTAL ZONE ENVIRONMENTAL QUALITY ASSESSMENT, REGION 3, NORTH COASTAL FLORIDA.
North Central Florida Regional Planning Council, Gainesville.
For primary bibliographic entry see Field 5G.
W78-08986

GUIDELINES FOR EVALUATING PROPOSED WETLANDS ALTERATIONS IN SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept., Columbia.
M. O. Bara, R. W. Tiner, Jr., and D. C. Newkirk.
July, 1977. 28 p.

Descriptors: *South Carolina, *Wetlands, *Land management, *Environmental effects, Local governments, Permits, Bocks, Bulkheads, Sea walls, Groins(Structures), Jetties, Transmission lines, Marinas, Dredging, Impoundments, Sewage lagoons, Drainage, Barrier islands, Beaches, Mud flats, Bays, Sounds, Salt marshes, Marshes.

This report contains guidelines to assist the South Carolina Wildlife and Marine Resources Department in evaluating proposed wetlands alterations. The guidelines may also prove helpful in stimulating more effective management of wetland resources by local governments and other state agencies. Marshes are an important component of the tidal wetlands system. They protect highlands from erosion and storm damage and are highly productive areas for wildlife. The guidelines call for planning processes and evaluation of probable effects of proposed land uses. The broad purpose of the guidelines is to encourage communications between the Department and those wishing to alter procedure for any alteration in navigable waters. Also included is an evaluation of wetland development proposals. Both general guidelines and specific guidelines are set forth. An appendix which describes proposed works is included. Also included are appendices on enforcement, public agencies, and references. (Quarles-Florida).
W78-08987

FLORIDA ENVIRONMENTALLY ENDANGERED LANDS PLAN.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
For primary bibliographic entry see Field 6G.
W78-08988

WATER QUALITY OF THE OHIO RIVER, LOUISVILLE, KENTUCKY-EVANSVILLE, INDIANA.
National Field Investigations Center-Cincinnati, OH.
For primary bibliographic entry see Field 5B.
W78-08989

EXECUTIVE SUMMARY OF SECTION 208 PROGRAM FOR DESIGNATED AREAS. FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08990

PROCEEDINGS ON CONFERENCE ON GEOTHERMAL ENERGY AND THE LAW

HELD IN SANTA BARBARA, CALIFORNIA ON FEBRUARY 3, 4 AND 5, 1975.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 509, Price codes: A05 in paper copy, A01 in microfiche. 1975. 77 p.

Descriptors: *Geothermal studies, *State governments, *Federal government, *Energy, Water law, Legislation, Utilities, Water policy, Public utilities, Public rights, Administration, Local governments.

The Conference on Geothermal Energy and the Law was held in Santa Barbara, California on February 3, 4 and 5, 1975. The purpose of the conference was to: (1) identify the constraints the law imposes on geothermal development; and (2) establish the groundwork for recommending appropriate reforms in federal, state and local structures, both legal and institutional. Persons participating in the conference were deliberately selected from a wide cross-section of interests among federal and state agencies, large and small producers, and major and independent utilities. The reports of the six work groups are included in the document. The reports included are: (1) problems of pre-developmental and early developmental stages; (2) problems of promoting entry and investment; (3) problems of preserving government, public and private owner interests; (4) problems of coordinating development with state water laws; (5) problems of overlapping administration; and (6) problems involving utilities and dependent users. (Quarles-Florida)
W78-08991

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES,
Environmental Protection Agency, Washington, DC. Office of Federal Activities.
For primary bibliographic entry see Field 5G.
W78-08992

REPORT FOR THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT, OF THE SENATE COMMERCE COMMITTEE HEARING ON MERCURY CONTAMINATION UNDER THE DIRECTION OF SENATOR PHILLIP A. HART, AT MT. CLEMENS.
Federal Water Quality Administration, Chicago, IL. Great Lakes Region.
For primary bibliographic entry see Field 5G.
W78-08993

COASTAL ZONE ACT.
Louisiana Coastal Law, No. 27, p. 1-2, September, 1977.

Descriptors: *Louisiana, *Commercial fishing, *Management, *Coasts, Fisheries, Fish harvest, Fish management, Planning, Administration, Water quality standards, Gill nets, Natural gas.

In 1977, the Louisiana legislature passed important legislation effecting coastal zone management, gill nets and fishery resource management, and energy regulation. A coastal zone management program was headed by a Coastal Commission represented by varying and competing interests in the coastal zone. The Act has been criticized as containing deficiencies including: a three mile boundary; failure to provide for areas of unique biological or ecological importance; discretion in local governments on whether to adopt a management plan; and failure to provide for statewide review. A second issue was the regulation of monofilament gill net, which is cnsidered one of the most effective types for taking fish. Limitations on catches and restricted areas were designed to rectify the recent decreases in trout and red drum catch. A third area involved energy resources. Legislation was passed to regulate the minimum price of intrastate first sales of natural gas, to cause increased production and to make Louisiana purchaser's the most desirable customers. In addition, legislation was passed to allow the building of coal pipelines to comply with the President's energy plan to convert some Louisiana industries to the use of coal. (Kastner-Florida)
W78-08994

NATIONAL SECURITY INTERESTS IN OCEAN SPACE,
Department of Defense, Washington, DC. Advisory Group on Law of the Sea.
L. S. Ratiner.
Natural Resources Lawyer, Vol 4, No 3, p 582-96, 1971.

Descriptors: *Oceans, *International law, *Resources, *International waters, Continental shelf, Coasts, Continental slope, Planning, Treaties, Coordination, Management.

Under customary international law coastal states have sovereign rights to control seabed resources, exploration and exploitation. The seaward extent of this control is not settled since the meaning of adjacency or exploitability has not been agreed upon. The National Petroleum Council has adopted the view that the United States now has vested sovereign rights over seabed resources to the souter edge of the submerged continent. In contrast, the United States Government proposed an international treaty under which national jurisdiction over seabed resources should end at a point where the waters reach a depth of two hundred meters and that beyond that point a trusteeship zone should be creates which embraces the remainder of the continental margin. In that zone coastal states would, as trustees for the international community administer the mineral resources. Developing countries as well as landlocked and shelf-locked countries countries could thus share in the wealth of ocean development. The United States Government welcomed criticism of the proposal from National Petroleum Council. Refuting the criticism, the government concluded that it is only through a process of critical analysis that a satisfactory treaty can be produced. (Kastner-Florida)
W78-08995

THE RIGHT OF INTERVENTION OF COASTAL STATES ON THE HIGH SEAS IN CASES OF POLLUTION CASUALITIES,
New Brunswick Univ., Fredericton. Law School.
For primary bibliographic entry see Field 5G.
W78-08996

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08997

COASTAL ENERGY IMPACT PROGRAM.
National Oceanic and Atmospheric Administration, Washington, DC.
Federal Register, Vol. 43, No. 37, p. 7546-7566, (February 23, 1978).

Descriptors: *Administrative agencies, *Coasts, *Energy, *Local governments, *Regulation, Administrative decisions, Coastal engineering, Energy dissipation, Federal government, Governments, Governmental interrelations, Law enforcement, Legislation, Management, Oceans, Shores, Standards, State governments, Water law.

The National Oceanic and Atmospheric Administration has promulgated a rule describing administrative procedures to implement the Coastal Energy Impact Program (CEIP). The CEIP will provide grants and credit assistance to coastal states and communities to help them deal with the impacts of coastal energy development. The CEIP was created by the 1976 amendments to the Coastal Zone Management Act of 1972. The central objective of the CEIP is to provide coastal states and units of local governments with financial assistance to mitigate the adverse on-shore effects of new or expanded coastal energy activity. The goal of providing repayment assistance under CEIP is to shift to the federal government most of the risk of fiscal loss that might be borne by coastal states and local governments in whose jurisdictions new or expanded rational, timely, and thorough planning for and management of the consequences in the coastal zone of energy facility siting and energy resource development. (Jordan-Florida)
W78-08998

GEOTHERMAL RESOURCES OPERATIONS.
Geological Survey, Washington, DC.
Federal Register, Vol. 43, No. 22, p 4264-4267 (February 1, 1978).

Descriptors: *Geological surveys, *Geothermal studies, *Electric powerplants, *Regulation, *Energy, Administration, Administrative agencies, Administrative decisions, Electric power production, Federal reservations, Geology, Geophysics, Permits, Public lands, Thermal springs, Thermal water, Wells, Steam, Subsurface investigations, Heated water.

The United States Geological Survey has proposed a revision of its regulations concerning geothermal resources operations on public, acquired, and withdrawn lands to permit the construction and operation of geothermal steam power facilities on fedeal lands leased for geothermal resources. The proposed rule authorizes the Area Geothermal Supervisor to approve the construction of geothermal steam power facilities and to supervise their operation. The proposal also sets forth the information submission and application procedural requirements which the operator of a proposed facility must satisfy in order to obtain the Supervisor's approval of construction and operation. These requirements include: (1) a plan of utilization; (2) plans for all proposed structures; (3) a schematic flow diagram; (4) a startup data and schedule of construction; (5) a description of any tests, studies or surveys planned to assess the geologic suitability of the sites; (7) a map showing the existing and planned access roads; and (8) the methods for disposing of waste water, solid wastes, and noncondensible gases. One purpose of regulation of geothermal facilities is to assure the orderly and timely development of federal geothermal leases. (Jordan-Florida)
W78-08999

REQUIREMENTS FOR APPROVAL OF DISCHARGES TO AQUACULTURE PROJECT.
For primary bibliographic entry see Field 5G.
W78-09000

COOPER V. WISDOM (PUBLIC HEARINGS REQUIRED BEFORE ISSUING DREDGE AND FILL PERMITS).
440 F. Supp. 1027. (1977).

Descriptors: *Dredging, *Boat-launching ramps, Construction, *Permits, *Florida, Administrative agencies, Facilities, Federal government, Engineering structures, Landfills, Naval architechture, Navigable waters, Recreation facilities, Water law, Water pollution, Adjudication procedure, Regulation, Judicial decisions, Federal Water Pollution Control Act, Decision making.

The Army Corps of Engineers (Corps) issued a permit to allow dredge and fill operations in Biscayne Bay to construct a boat ramp. The Corps did not hold a public hearing concerning the merits of the permit nor make a written determination

that the issues were insubstantial or that there was otherwise no valid interest to be served by a public hearing. The plaintiff, who brought action in federal district court, argued that these omissions were violations of the Corps' own regulations and he asked that a restraining order be issued against the boat ramp builders. The defendant Corps contended that its duty under the administrative regulations was discretionary. The court held that the language of the Corps regulation was mandatory, and that the Corps had a duty to hold a public hearing or to inform the plaintiff in writing of the reasons for not holding one. Since the public has a strong interest in the presevation of marine ecology, and in the proper functioning of the Corps in granting a permit, the court issued a permanent injunction against the permit. The Corps was directed to comply with the regulations in processing any new permits. (Jordan-Florida)
W78-09001

RIVERSIDE IRRIGATION DISTRICT V. LAMONT (IRRIGATION DISTRICTS HAVE EMINENT DOMAIN AUTHORITY).
572 p. 2d 151-153 (Colo., 1977), modified, December 27, 1977.

Descriptors: *Colorado, *Condemnation, *Irrigation districts, *Groundwater mining, *Water source, Condemnation value, Easements, Eminent domain, Groundwater, Groundwater potential, Groundwater resources, Irrigation, Irrigation ditches, Irrigation practices, Irrigation systems, Land tenure, Legal aspects, Right-of-way, State governments, Water law, Water supply, Water table, Water wells.

The irrigation district owned a right-of-way for a canal that extended through the landowner's ranch. The district wanted to acquire a right-of-way two hundred feet wide along the southern margin of the canal for the purpose of drilling groundwater wells to augment its supply of irrigation water. Unable to agree with the land owners on a price, the district sued to condemn the property. The landowners contended that there was no express grant of authority to irrigation districts to condemn land for groundwater wells and that federal law prohibited this condemnation. The trial court held for the landowners and the district appealed. The Supreme Court of Colorado reversed the trial court's decision on the ground that irrigation districts do have the authority under Colorado statutes to condemn property. The court found that Colorado law gives municipal corporations such as irrigation districts the power to acquire easements necessary for the purposes of those corporations. The court also held that the federal law relied on by the landowners applied only to rights-of-way over public lands and was irrelevant to the land in question. (Jordan-Florida)
W78-09002

MOONEY V. KUIPER (EXTENSION OF WELL CONSTRUCTION PERMITS FOR GOOD CAUSE).
573 p. 2d 538-540 (Colo., 1978).

Descriptors: *Colorado, *Administrative agencies, *Water rights, *Well permits, Drilling, Groundwater, Irrigation wells, Legal aspects, Legislation, Permits, Prior appropriation, Regulation, Water sources, Water supply, Water supply development, Well regulations, Wells.

The plaintiffs, landowners, were awarded conditional water decrees by the water court based upon two well construction permits that had been issued by the state engineer. These one year will permits had been extended for an additional year because of the time needed to obtain the water decrees. The plaintiffs, needing additional time to complete their wells, requested a second extension. The state engineer, however, took the position that Colorado law limited his authority to granting a single, non-renewable one year extension. The water court agreed that the state engineer and the plaintiffs appealed. The plaintiffs contended that, in light of other provisions relating to water rights, the legislature must have intended to allow renewable one year extensions of well permits upon annual showings of good faith. The Supreme Court of Colorado reversed the water court and declared that it would be unreasonable and inconsistent to hold that a conditional water right could be granted on the basis of the amounts stated in a particular well permit, but that the permit could not then be extended to allow diligent pursuit of those rights awarded in the conditional decree. (Jordan-Florida)
W78-09003

ORR V. CITY AND COUNTY OF DENVER (ABANDONMENT OF WATER RIGHTS).
572 p. 2d 805-811 (Colo., 1977), rehearing denied October 24, 1977.

Descriptors: *Colorado, *Groundwater, *Irrigation water, *Preferences(Water rights), *Water wells, Appropriation, Aquifers, Diversion, Groundwater availability, Groundwater mining, Groundwater resources, Irrigation, Legal aspects, Prior appropriation, Underground streams, Water law, Water resources, Water yield, Water rights.

The water court granted the applicants' application for underground water rights and the use of water wells as alternate points of diversion for the applicants' decreed surface water. The City of Denver appealed on the grounds that the rights represented by the applicants' surface decrees had been abandoned, and that the change in points of diversion requested by the applicants would cause substantial harm to junior appropriators. The city alleged that for extended periods of time there was nonuse or only partial use of the upper portion of applicants' water ditch. Testimony was presented to the water court to the effect that through the years, the applicant had used seepage water and well water as alternate sources of supply. The Supreme Court of Colorado held for the applicant, and stated that the key issue was whether there was an instant on the part of the applicant to abandon any of the decreed water. The supreme court found that the evidence supported the water court's holding that there was no intent to abandon the water rights. (Jordan-Florida)
W78-09004

STATE OF WYOMING BY AND THROUGH CHRISTOPULOS V. HUSKY OIL COMPANY OF DELAWARE (ASSERTION OF MUNICIPAL WATER RIGHTS BY A PRIVATE USER).
575 P. 2d 262-284 (Wyo. 1978).

Descriptors: *Wyoming, *Municipal water, *Water reuse, *Water pollution sources, *Water storage, Adjudication procedure, Administrative agencies, Cities, Effluents, Impaired water use, Legal aspects, Oil industry, Appropriation, Reclaimed water, State governments, Water law, Water pollution, Water rights, Water works.

Administrative agencies of the state of Wyoming appealed a decision of the trial court in favor of defendant oil company. The trial court held that the company's plan to impound and recycle effluent water remaining after its refinery process was not subject to the jurisdiction and control of the agencies. The water was purchased by the company from the city of Cheyenne. The trail court also declared that the proposed use did not infringe upon the rights of downstream appropriators. The appealing administrative agencies contended that the company's plan to impound the water rather than return it to the stream was a change and expansion of use of a direct-flow water right under the jurisidiction of the agencies. The Supreme Court of Wyoming sent the case back to the trial court with instructions to bring in the city of Cheyenne as an indispensable party. The court held that the interests which the company asserted were inextricably tied into the city's ownership of the water right and could be asserted on the basis that the city as owner of the right could take the steps the company sought to take. (Jordan-Florida)
W78-09005

DANIELS IRRIGATION COMPANY V. DANIEL SUMMIT COMPANY (FINALITY OF STATE ENGINEER'S DECISION ON WATER RIGHTS QUESTIONED),
571 P. 2d 1323-1325 (Utah, 1977).

Descriptors: *Utah, *Adjudication procedure, *Remedies, *Preferences(Water rights), Administrative agencies, Beneficial use, Diversion, Domestic water, Irrigation, Irrigation ditch, Irrigation systems, Irrigation water, Legal aspects, Permits, Prior appropriation, Water law, Water rights, Water sources, Water utilization, Administrative decisions.

Plaintiff brought an action on two counts: (1) to appeal the state engineer's decision approving the defendant's change application which asserted an irrigation right, and (2) to quiet title to the waters of a creek. The trial court dismissed the first count as not being timely prosecuted, and it declined to determine the rights of use of the parties because it deemed the state engineer's decision to be final. The plaintiff appealed and asserted that the trial court erred in treating the state engineer's decision as a final judicial act foreclosing the court's right to decide the respective water rights of the parties. The Supreme Court of Utah reversed and sent the case back to the trial court for a decision on the rights of the parties. The supreme court declared that the state engineer was a part of the executive branch of government, his duties were limited to administrative matters, and the proceedings before him were not judicial in nature. The supreme court found that the state engineer acted in an administrative capacity only and had no authority to determine the water rights of the parties. (Jordan-Florida)
W78-09006

ENGLISH BAY ENTERPRISES, LTD. V. ISLAND COUNTY (CLAM HARVESTING IN WASHINGTON BY A CANADIAN CORPORATION SUBJECT TO THE SHORELINE MANAGEMENT ACT).
89 Wash. 2d 16, 568 P. 2d 783-787 (Wash., 1977).

Descriptors: *Washington, *Permits, *Administrative decisions, *Shellfish, *Shellfish farming, Clams, Bays, Leases, Planning, Fish, Jurisdiction, Navigable waters, Administrative agencies, Environmental effects, Silts, Beaches, Dredging, Tidal waters, Local governments.

Plaintiff, a Canadian corporation engaged in the business of clam harvesting on tidelands, filed a substantial development permit application with defendant, a Washington county, seeking approval of its operations. Upon denial of its application by the board of county commissioners, plaintiff appealed to the Shoreline Hearings Board which found that the operation was subject to the Shoreline Management Act and denied the appeal. Plaintiff contended that its operation was not subject to the Shoreline Management Act or, alternatively, that its operation was consistent with the Act. Plaintiffs harvested clams using mechanical methods which the Hearings Board found harmed the shoreline environment. The Board insisted that plaintiffs' operation involved dredging, dumping, filling and substantial development within the meaning of the Act. The Supreme Court of Washington held that there was substantial evidence to support the Board's findings of fact. The court concluded that the clam harvesting operation was subject to the Shoreline Management Act. (Quarles-Florida)
W78-09007

SISLEY V. SAN JUAN COUNTY (REQUIREMENT OF AN ENVIRONMENTAL IMPACT STATEMENT FOR CONSTRUCTION OF MARINA IN WASHINGTON).
89 Wash. 2d 78, 569 P. 2d 712-719 (Wash., 1977).

Descriptors: *Washington, Construction, *Marinas, *Environmental effects, *Administrative decisions, Local governments, Permits, Bays, Administrative agencies, Environment, Navigable waters, Leases, Legal review, Legal aspects, Piles(Foundations).

Plaintiffs, residents living near the bay at issue, brought a class action suit against defendant, a Washington county. Plaintiffs sought a declaration that a permit to build a marina was illegal and void until an environmental impact statement was prepared. The applicant builder intervened as an additional defendant. Defendant builder applied for a substantial development permit under the Shoreline Management Act to build a commercial marina and supporting facilities at the head of a small bay. The necessary permit was obtained from the Board of County Commissioners and defendant began construction. On the action brought by plaintiffs, the Superior Court ordered the Board to review the evidence to determine the need for an environmental impact assessment. At the close of a public hearing, the Board ruled that an assessment was unnecessary and the lower court concurred. The Supreme Court of Washington held that the permit approval constituted an action within the meaning of the Environmental Policy Act which requires an environmental impact statement. The Oregon Supreme Court found that the Superior Court applied the wrong standard of review in upholding the Board's decision that the marina would not have significant environmental impact was erroneous. (Quarles-Florida)
W78-09008

CITY OF NORTH ST. PAUL V. MINNESOTA WATER RESOURCES BOARD (AUTHORITY OF STATE WATER RESOURCES BOARD TO CREATE WATERSHED DISTRICTS).
260 N.W.2d 584-587 (Minn., 1977).

Descriptors: *Minnesota, *Watershed management, *Administrative decisions, *Watersheds(Basins), Water resources, State governments, Administrative agencies, Legal review, Legal aspects, Local governments, Legislation, Water management(Applied), Levees, Flood control, Hydrologic data, Conservation, Water districts.

Plaintiffs, cities of Minnesota, challenged the inclusion of a creek subwatershed within a newly created watershed established by the Minnesota Water Resources Board, defendant. The watershed district at issue was established pursuant to state statute. A petition was filed and public hearings were held before the creation of the watershed. At the public hearing, plaintiffs argued that the creek area constituted a separate watershed, that the waters did not physically mingle, and that the water management problems of the creek were different from the rest of the district. These arguments were rejected by the Board. On appeal, plaintiffs contented that the relevant statute required the Board to base its decision of inclusion on scientific evidence. Plaintiffs further insisted that the Board's order was not supported by substantial evidence. The Supreme Court of Minnesota held that although the Board was obliged to base its decision on scientific principles, the facts to which such principles apply need not be scientific. The court also found that the Board's decision was supported by substantial evidence. (Quarles-Florida)
W78-09009

UNITED STATES STEEL CORPORATION V. ILLINOIS POLLUTION CONTROL BOARD (VALIDITY OF STATE WATER POLLUTION CONTROL REGULATIONS; CONSISTENCY WITH FEDERAL WATER POLLUTION CONTROL ACT).
52 111. App. 3d 1, 367 N.E.2d 327-336 (1977).

Descriptors: *Governmental interrelations, *Illinois, *Federal Water Pollution Control Act, *Water pollution control, Permits, Regulation, Environmental control, Administration, Standards, Water quality, Water pollution, Water pollution sources, Navigable waters, Legal aspects, Water policy, Water law, Judicial decisions, Watercourses(Legal aspects), Legislation, Discharge(Water), Industrial wastes.

Plaintiff corporation petitioned for defendant state agency's regulations promulgated under the Illinois Environmental Protection Act. The regulations established standards for control of the discharge of pollutants from point sources into the navigable waters of Illinois. Plaintiff contended that the rule requiring a permit applicant to determine whether or not a pollutant was present in its discharge, to any extent whatsoever, exceeded the agency's delegated authority and contravened tha National Pollution Discharge Elimination System (NPDES) permit practices under the Federal Water Pollution Control Act (FWPCA). NPDES permits usually grant general authorization to discharge limited by specific conditions. Affirming the adoption of the rule, the appellate court held that the regulations were consistent with both Illinois law and the FWPCA. The court also held that plaintiff had failed to show that the regulations were arbitrary or capricious since the agency's hearings sufficiently considered technical feasibility and economic reasonableness. The court also rejected arguments that the regulations placed an undue burden upon the conduct of business beyond the state's police power, or that the regulations denied procedural due process. (Hoofman-Florida)
W78-09010

COUNTY OF TRINITY V. ANDRUS (FEDERAL AGENCY'S RIVER PROJECTATIONS HELD NOT IN VIOLATION OF FEDERAL OR STATE LAWS).
438 F.Supp. 1368-1391 (E.D. Cal., 1977).

Descriptors: *California, *Federal-state water rights conflicts, *Water distribution(Applied), *Legislation, Local governments, Federal government, United States, Droughts, Legal aspects, Judicial decisions, Administrative agencies, Administrative decisions, Environmental effects, Dams, Drawdown, Water levels, Fish conservation, Headwaters, Rivers, Governmental interrelations, Water rights.

Plaintiffs, a California county and Indian intervenors, sought injunctive relief to stop defendant, Department of Interior, from the planned operation of the Trinity River Division of the Central Valley Project in response to the 1976-1977 California drought. Within plaintiff county's borders lies the Trinity River, an excellent fish habitat. The Indian tribe lives along the river which is their principal source of food. Due to the California drought, defendant agency diverted some of the river flow to other areas, which in turn produced a decline in the fish population. Plaintiffs alleged that such operation would be in violation of the following federal and state laws: the Trinity Act; the Fish and Wildlife Coordination Act of 1964; the Andromous Fish Act; the Reclamation Act of 1902; and California water law. Plaintiffs also argued that an environmental impact statement as required by the National Environmental Policy Act (NEPA) should be filed before any further diversion occurred. The federal district court analyzed the statutes in controversy and held that plaintiffs' contentions lacked merit. However, the court stated that defendants were obligated to reassess their actions in light of environmental impacts to satisfy the policy of NEPA. (Quarles-Florida)
W78-09011

JUPITER INLET CORPORATION V. TEQUESTA (MUNICIPALITY'S DEPLETION OF CONDOMINIUM COMPLEX'S AQUIFER IS A COMPENSATORY TAKING).
349 So. 2d 216-218 (Fla. Ct. App., 1977).

Descriptors: *Eminent domain, *Florida, *Groundwater, *Aquifers, *Saline water intrusion, Adjacent land owners, Condemnation, Wells, Groundwater movement, Discharge(Water), Damages, Legal review, Public rights, Water rights, Groundwater flow, Municipal water, Water supply.

Plaintiff condominium corporation sought recovery from municipality for the taking of water from a shallow aquifer underneath the owner's land, to the extent that it deprived the owner of the beneficial use of the shallow aquifer. Defendant operated a wellfield in close proximity to plaintiff's land, and resulting saltwater intrusion made the aquifer useless as a source of water. Plaintiff then had to obtain water from the deeper Floridan aquifer, at greater expense. The court held that the municipality's right to take property is limited to public purposes and with full compensation paid to the owner. Without the formal exercise of eminent domain, the owner had a cause of action for inverse condemnation. Removal of water was a taking, and full compensation must be paid whether government agents entered the property to take the water or pumped the water out from adjacent lands. The trial court was bound to have erred in granting a summary judgement to the municipality, since sufficient facts existed for an inverse condemnation cause of action. (Molloy-Florida)
W78-09012

COMPLAINT OF STEUART TRANSPORTATION COMPANY (LIMITED LIABILITY FOR OIL SPILL CLEAN-UP COSTS).
435 F. Supp. 798-808 (E.D.Va., 1977).

Descriptors: *Oil spills, *Chesapeake Bay, *Federal Water Pollution Control Act, *Costs, Oil pollution, Water pollution, Virginia, Federal government, Damages, Negligence, Weather forecasting, Cost repayment.

Plaintiff sought exoneration of a limitation of liability for oil spill damage caused when plaintiff's barge sank in Chesapeake Bay. The sinking was caused by the badly worn equipment on the barge and the failure to remove scupper plugs from the spill rail, permitting water to build up. The deterioration was evident on inspection, which was not done by the plaintiff. The court found this failure to inspect to be ordinary negligence on the part of the plaintiff owner, and discounted any negligence on the part of the United States government for possible errors in forecasting the weather. The court also found that the lack of wilful negligent action on the part of the barge owner entitled him to limited liability under the Federal Water Pollution Control Act for federal claims for oil spill clean-up costs, assessed under Virginia oil cleap-up statutes. The federal statute limits only federal clean-up costs. (Molloy-Florida)
W78-09013

WYOMING ENVIRONMENTAL QUALITY ACT.
Wyo. Sess. Laws, Ch. 250, secs 35-487.1 through 35-487.56 (1973).

Descriptors: *Wyoming, *Water pollution control, *Water quality, *Environmental control, *Air pollution, Water permits, Water pollution, Permits, Federal government, Administration, Legal aspects, Water law, State governments, Legislation, Solid wastes, Land management, Land reclamation, Regulation, Pollution abatement, Water quality control.

Wyoming's Environmental Quality Act (WEQA) has as its purpose to prevent air and water pollu-

tion and to reclaim land. The state seeks to coordinate the efforts of the federal government, state agencies, and other states in the development and preservation of air, land, and water resources. The act creates within the executive branch the State Department of Environmental Quality (DEQ). The DEQ is divided into the air quality division, water quality division, and land quality division. The DEQ director administers and enforces all the provisions of the WEQA. Each division has an administrator who, under supervision of the director, administrates the provisions of the WEQA. The WEQA creates an independent environmental quality council which acts as the hearing examiner for the DEQ by conducting hearing and promulgating rules. An advisory board for each division is created to recommend to the council programs for the control of pollution. Separate articles in regard to water quality, air quality, and land quality. There is also a provision concerning solid waste management. (Quarles-Florida)
W78-09014

STATE WATER CONTROL BOARD V. TRAIN (FEDERAL EFFLUENT LIMITATIONS CHALLENGED BY PUBLICLY OWNED SEWAGE PLANT).
559 F. 2d 921-28 (4th Cir. 1977).

Descriptors: *Sewage treatment, *Water pollution, *Administrative agencies, *Federal Water Pollution Control Act, Waste water treatment, Waste water(Pollution), Water treatment, Regulation, Legislation, Sewage effluents, Discharge(Water), Grants, Municipal wastes, Waste treatment, Water pollution control, Water pollution sources, Sewage disposal, Sewage.

The State Water Control Board of the Commonwealth of Virginia brought action against the Administrator of the United States Environmental Protection Agency, seeking a declaration that the effluent limitations of Section 301(b)(1) of the Federal Water Pollution Control Act Amendments of 1972 did not apply to publicly owned sewage treatment plants which have not received federal grants under Title II of the Act. The district court denied the Board the relief sought. The Court of Appeals, Fourth Circuit, affirmed. In seeking elimination of discharge of pollutants into the nation's navigable waters by 1985, Section 301(b)1) requires publicly owned treatment plants to reach certain effluent reduction standards by July 1, 1977. The Board argued that a federal grant under Title II of the Act was a condition precedent to the duty to comply with the 1977 effluent standards. The court rejected that argument, finding the 'plain meaning' of the statute to be unconditional compliance. Legislative history clearly showed the July 1, 1977 target to be inflexible. The court added that their holding does not mean, absent Congressional action, severe sanctions will be imposed on municipalities failing to meet the 1977 deadline. (Thomas-Florida)
W78-09015

PEOPLE V. SWEETSER (PUBLIC ENTITLED TO USE NAVIGABLE RIVERS FOR RECREATION EVEN IF RIVER BED PRIVATELY OWNED).
140 Cal. Rptr. 82-7 (App. 1977).

Descriptors: *California, *Riparian rights, *Public access, *Recreation, Public rights, Right-of-way, Boating, Embankments, River beds, Rivers, Trespass, Easements.

The defendant was convicted of criminal trespass for using a small unimproved portion of a highway easement, located within a ranch, to ingress to and egress from a river. The Fifth District Court of Appeals in California reversed the conviction. The court first held that is was clear that the defendant was not trespassing when he was kayaking on the river since 'the public has a right to use for boating,...and all other recreational purposes, any part of a river can be navigated by small recreational or pleasure boats, even though the river bed is privately owned'. In addition, it was clear that the defendant was walking within the perimeters of the county easement and complying with the purposes of a public highway easement which includes 'every kind of travel...which is not prohibited by law or by a restriction in the easement itself'. While the county may have placed restrictions on its easements, or make agreements with the landowners, no such agreement was proven in the case. In the absence of an agreement altering the easement, the defendant was properly using the easement. (Kastner-Florida)
W78-09016

MATTER OF ZITTEL'S MARINA, INC. (REVIEW OF LOCAL AGENCY GRANT OF PERMIT TO IMPROVE MARINA).
565 P. 2d 1196-1205 (Wash. App. 1977).

Descriptors: *Washington, *Marinas, *Permits, *Construction, Facilities, Recreation facilities, Docks, Water law, Administrative decisions, Erosion, Regulation, Shore protection, Boundaries(Property), Adjacent land owners, Navigable waters, Legal aspects, Dredging, Land development, Structures, State governments.

The defendant county approved a permit for an existing marina to construct facilities and make other improvements. Plaintiffs, adjacent landowners, filed suit and asserted that expansion of the marina will impair the aesthetic value of their property, restrict boat access, and have an adverse effect on the fish and shellfish in the area. Plaintiffs objected to the granting of the permit and claimed that the new facilities would increase the negative environmental impacts. The county's approval of the permit was affirmed by the Shorelines Hearing Board (SHB) and by the county superior court. Affirming the lower court decision, the appellate court held that the proceedings of the SHB, a quasi-judicial body, must be affirmed unless those proceedings are clearly erroneous or arbitrary and capricious. The court also held that the decision of the SHB was supported by the record. The court noted that SHB took into consideration the fact that approval of expansion of the existing marina would have less adverse impact on the environment than the creation of an additional totally new marina. The court found no mistake, or clearly erroneous, or arbitrary action by the SHB. (Jordan-Florida)
W78-09017

WATER ASSESSMENT (75) -- PLAN OF STUDY.
Water Resources Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 378, Price codes: A03 in paper copy, A01 in microfiche. August 1974. 27 p.

Descriptors: *Water resources, *Land resources, *Planning, *Water policy, Assessments, Budgeting, Scheduling, Water resources planning, Water management, Plan of study, *National priorities, Problem analysis.

The 1975 Assessment of Water and Related Land Resources, initiated by the U.S. Water Resources Council in 1974, was designed to identify and describe the country's most severe water problems, indicate priorities, and emphasize the need to resolve those problems. The first assessment was completed in 1968, and outlined a continuing assessment process. The current assessment is intended to describe the problems in more geographical detail and with more regional and public participation. The Plan of Study had four functions. The first was to overview the 1975 Assessment, describing its major products and its activities schedule, budget and operations. The second function was to inventory the nationwide analysis activities that were then being conducted by cooperating Federal agencies. Third and fourth, a specific problem analysis and a national purpose analysis were discussed, with each analysis' purpose, objectives, expected product and study schedule described. The Water Resources Council will make four recommendations: the extent of the national interest and the Federal role in helping to provide the capability to meet needs and resolve problem issues; the geographical areas where Level B planning studies should be developed or updated, between both 1975-85 and 1985-2000; data-collection and information-development program modifications necessary for implementing a continuing assessment process and to provide for the collection of data to support planning studies; and changes that need to be considered in various institutional arrangements and policies to provide an improved basis for resolving high-priority problems. (Zayac-NC)
W78-09065

REGIONAL GOVERNMENTAL ARRANGEMENTS IN METROPOLITAN AREAS: NINE CASE STUDIES,
Institute for Community Studies, Kansas City, MO.
C. J. Hein, J. M. Keys, and G. M. Robbins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 350, Price codes: A11 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., January 1974. 240 p, 24 fig, 15 tab.

Descriptors: *Governmental interrelations, *Local governments, *Cities, *Urban areas, Administration, Municipalities, State jurisdiction, State governments, *Regional governments, Urban counties, Governmental reform, Special districts, Minneapolis-St. Paul(MN), Detroit(MI), St. Louis(MO), Seattle(WA), San Antonio(TX), Washington(DC), Miami(FL), Nashville(TN), Toronto(Canada).

The study's purpose is to review the experiences of metropolitan areas with the major forms of regional governments. Nine case studies were done of different types of regional governmental arrangements grouped under the categories of: regional councils, (Minneapolis-St. Paul and Detroit); multi-purpose special districts (St. Louis and Seattle); unified urban governments (San Antonio); urban counties (Washington, D.C.); urban counties with some second-tier cities (Miami); city-county consolidations (Nashville); and two-tier federation (Toronto). The general conclusion is that the county--usually with a modernized structure and urban powers--serves as the core of regional governmental structures in the U.S. No multi-county regional governments were found. The durability of county boundaries and the adaptability of the county to urban government appear to be the most practicable basis for metropolitan governmental reform in the near future. The multi-purpose multi-county special district has been offered as a model for metropolitan reform for many years, but it does not exist in the U.S. and no example was found of such a district successfully operating major programs in a multi-county area. All of the regional governmental arrangements studied were found to be suffering from inability to make their boundaries coincide with the boundaries of regional problems. But patterns of regional governmental arrangements based on the urban county were judged more effective in dealing with emerging environmental management problems than patterns based on special districts and regional councils of government; the two-tier federation was judged about equal to the best of the urban county arrangements. Further state action is recommended for every case in order to make the regional arrangements more effective. (Zayac-NC)
W78-09069

MICROMANPOWER PLANNING IN THE PUBLIC SECTOR,
For primary bibliographic entry see Field 6B.

W78-09071

HYDROELECTRIC POWER AND SCENIC PROVISIONS OF THE 1950 NIAGARA TREATY,
Waterloo Univ., (Ontario). Dept. of Geography.
B. F. Friesen, and J. C. Day.
Water Resources Bulletin, Vol. 13, No. 6, p 1175-1189, December 1977. 4 fig, 2 tab, 30 ref.

Descriptors: *Hydroelectric power, *Niagara Falls, Niagara River, Great Lakes, International, Water management(Applied), Scenic preservation, Treaties, Power diversion, Costs, Benefits.

An important international Niagara River management issue concerns allocation of the average 202,000 cubic feet per second river discharge for hydroelectric power and scenic purposes. Major water diversions from Niagara Falls are necessary for power production. Flow is allocated by the 1950 Niagara Treaty which is intended to maximize power benefits and preserve and enhance the scenic falls spectacle. Examined is the extent to which the Treaty objectives have been achieved. Based on analyses of government documents, engineering data, and falls-viewing patterns, it is concluded that the 1950 Treaty led to enhancement of the falls spectacle and increased power generation. But significant additional power diversions probably are attainable without adverse effect upon the existing falls spectacle. Reducing daytime summer Horeshoe Falls flow and scheduling spring and autumn flow according to viewing patterns are possible means of increasing power diversions. Existing generating facilities could use considerably more water and the value of additional Niagara hydroelectricity is very high in terms of generation-cost savings over alternative power sources. Because of the cultural importance of the falls, Treaty modifications to permit increased power diversions are not recommended without prior public opinion sampling and on-site viewing experiments. These findings highlight the need for more careful study before long-term international agreements are concluded and illustrate the need for more flexible treaty arrangements to permit periodic adjustments for changing conditions. (Graf-Cornell)
W78-09180

WORKSHOP ON THE VISTULA AND TISZA RIVER BASINS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09188

THE VISTULA RIVER PROJECT,
For primary bibliographic entry see Field 6A.
W78-09189

REGULATION OF HARBORS AND PONDS OF MARTHA'S VINEYARD,
Woods Hole Oceanographic Institution, MA. Marine Policy and Ocean Management Program.
J. M. Friedman, R. A. Donnellan, and G. H. Nickerson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 425, Price codes: A04 in paper copy, A01 in microfiche. Report WHOI-76-56, May 1976. 58 p. NOAA 04-6-158-44016.

Descriptors: *Civil law, *Harbors, *Ponds, *Shores, *Massachusetts, Wetlands, Public access, Shellfish, Fishing, Coasts, Tidal waters, Seashores, Structures, Legal aspects, Legislation, Water law, *Martha's Vineyard(Mass).

These papers provided a brief analysis of the statutory framework for regulation of activities in the harbors and great ponds of Massachusetts. Several issues were treated in more detail: the difficulty of providing public access to great ponds and certain beaches; local authority over shellfishing; and permits for structures and alterations in tidal waters. Constitutional questions also were discussed, including the problem of discrimination by towns against non-residents in the municipal administration of natural resources. (Sims-ISWS)
W78-09222

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, Washington, DC.
W. H. Veeder.
Law and Contemporary Problems, Vol. 40, No. 1, p 77-96, 1977. 118 ref.

Descriptors: *Water rights, *Yellowstone River Basin(MT WY), *Coal mines, *Montana, *Wyoming, *Indian reservations, *Legal aspects, Political aspects, U.S. Bureau of Reclamation, Conflict, Judicial decisions, History, Governments, Energy, Winters v. United States, River basins, River basin development, Strip mines, Resource allocation, Water resources, Water supply.

A serious conflict over water rights has developed in and around the coal fields of the Yellowstone River basin of southeastern Montana and northeastern Wyoming, with Indians of two reservations most gravely threatened because of insufficient water supplies. Federal and state policies, agencies, and water rights are often in conflict with one another and with those claiming rights under state laws such as farmers and cattlemen. The Bureau of Reclamation has in addition entered into contracts with major energy companies for sale of water rights, sparking an interagency dispute. Indians of Montana's Crow and Northern Cheyenne Reservations and Wyoming's Arapahoe and Shoshone Tribes of the Wind River Reservation are directly affected by the conflicts. This paper traces the development and implications of the conflicting federal, state, and Indian claims under four headings: (1) development of federal and Western water law, (2) the clash of federal and state water rights, (3) nature and extent of Indian water rights, and (4) federal resource programs and Indian water rights. Several judicial decisions are reviewed, including the crucial Winters v. United States (1906) which enjoined the defendant against diverting water away from a Montana reservation. Underestimating water needs for coal-related industrial projects has been a major cause of the problems. (Lynch-Wisconsin)
W78-09241

TECHNOLOGICAL-FORCING AND FEDERAL ENVIRONMENTAL PROTECTION STATUTES,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W78-09245

WATER SUPPLY CATCHMENT POLICIES AND STUDIES FOR METROPOLITAN MELBOURNE,
For primary bibliographic entry see Field 6B.
W78-09250

GROUNDWATER STORAGE RIGHTS IN THE WESTERN STATES,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
J. D. Aiken.
Paper No. 77-2043 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 17 p, 45 ref.

Descriptors: Groundwater, Groundwater recharge, *Groundwater basins, Groundwater resources, *Legal aspects, *Legislation, *Storage(Underground), *Water rights.

Statutes and related court cases from California and Washington relating to the artificial storage and recapture of groundwater are summarized. Also some legal considerations that states should consider in establishing regulations for the artificial storage of groundwater, are discussed. (Skogerboe-Colorado State)
W78-09269

ECONOMIC IMPACTS OF ADMINISTRATIVE WATER LAW SYSTEMS,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
C. Kiker, and G. D. Lynne.
Paper No. 77-2042, presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 22 p, 20 ref.

Descriptors: Legal aspects, Legislation, *Water law, Economics, *Economic impact, *Administration.

There is a move to administrative regulation of water in the eastern states. Economic efficiency is largely being ignored in allocation of private entitlements to water. Several allocation alternatives that include economic criteria are examined. (Skogerboe-Colorado State)
W78-09270

SOIL EROSION AND SEDIMENTATION: ANALYSIS OF APPLICABLE LAW,
Virginia Polytechnic Inst. and State Univ., Blacksburgh Virginia Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Paper No. 77-2040, presented at the 1977 Annual Meeting, American Society of Agricultural Engineers. June 26-29, 1977, Raleigh, North Carolina, 12 p, 16 ref.

Descriptors: *Soil erosion, Erosion, *Sedimentation, *Legislation, Legal aspects, Water law.

Law applicable to activities that increase erosion and sedimentation exists in a variety of forms. The trend in the development of such law has been toward an expansion in scope of activities encompassed and an increase in the degree of legal accountability imposed for resulting injury. (Skogerboe-Colorado State)
W78-09273

6F. Nonstructural Alternatives

FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME II, MORGAN COUNTY - WASHINGTON COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
For primary bibliographic entry see Field 4A.
W78-09074

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, REDDING, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-09075

FLOOD PLAIN INFORMATION: TRINITY RIVER, LEWISTON LAKE TO JUNCTION CITY, TRINITY COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-09076

MANAGEMENT OF FLOODING IN A FULLY-DEVELOPED LOW-COST HOUSING NEIGHBORHOOD,
Halff (Albert H.) Associates, Inc., Dallas, TX.

J. I. Novoa, and A. H. Halff.
Water Resources Bulletin, Vol. 13, No. 6, p 1237-1252, December 1977. 4 fig, 3 tab, 6 ref.

Descriptors: *Floodplains, *Management, *Evaluation, *Alternative planning, *Non-structural alternatives, *Structural alternatives, *Peak Branch Watershed(Dallas TX), Trinity River(Texas), Flooding, Projects, Costs, Benefits, Streams, Parks, Greenways, Urban development, Low-cost housing.

Within the flood plain of the lower reach of Peaks Branch, a stream in east Dallas, Texas, 500 buildings would be partially inundated by the 100-year flood. The fully-developed watershed and flood plain mainly accomodate low-cost housing. Eight alternative flooding remedies, ranging from no action to stream channelization to complete redevelopment, are considered. The alternates are evaluated in terms of their relative safety, effects on neighborhoods, required relocations of families and businesses, initial costs, and maintenance costs. Creation of a stream-side greenway, offering lakes and parks, is recommended. This plan best balances costs and required relocations with community benefits, including flood protection. (Graf-Cornell)
W78-09178

RECLAMATION OF OPEN-PIT QUARRIES FOR MULTIPLE USES,
Bissell and Karn, Inc., San Leandro, CA.
R. W. Karn.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. UP1, p 127-135, July 1977.

Descriptors: *Planning, *Recreation facilities, *Zoning, *Reclamation, *Mining, *Quarries, *Gravel, Land use, Urban planning, Water resources, Water quality, Natural resources, Groundwater, Sands, Parks.

Reclamation plans for sand and gravel quarries are being required by many public agencies and are advantageous to the public and the quarry operator. Four projects in the San Francisco Bay Area are used to illustrate some problems that have been encountered in reclamation planning and in suggesting solutions. The projects considered herein are all open-pit quarries that contain impounded water and present excellent opportunities for reclamation for recreational uses. Discussed are government actions, existing projects, plan variables, recreation use problems, and the advantages of reclamation planning. A successful reclamation plant must be able to solve the existing problems and be capable of implementation; good engineering input will be required. (Bell-Cornell)
W78-09182

MAINTAINING WATER QUALITY IN VOYAGEURS NATIONAL PARK,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-09183

AN UNUSUAL CHALLENGE--AMERICAN RIVER PARKWAY,
Sacramento County Dept. of Parks and Recreation, CA.
For primary bibliographic entry see Field 6B.
W78-09184

SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 7B.
W78-09207

6G. Ecologic Impact Of Water Development

MARINE ECOLOGY AND OIL POLLUTION,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
For primary bibliographic entry see Field 5C.
W78-08881

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 1.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08891

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 2.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08892

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF. VOLUME 3.
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08893

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 1 AND 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08894

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME I: PHYSICAL CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08895

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
For primary bibliographic entry see Field 2L.
W78-08896

ECOLOGICAL EVALUATION OF PROPOSED DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS.
California Univ., Bodega Bay. Bodega Marine Lab.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5C.
W78-08899

CONTINUING DEVELOPMENT OF THE VULNERABILITY MODEL,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5B.
W78-08904

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 1 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08928

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 2 OF 3.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08929

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME II: BIOLOGICAL CONDITIONS, BOOK 3 OF 3,
Winzler and Kelly., Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08930

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 1 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08931

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME III: SOCIOECONOMIC CONDITIONS, BOOK 2 OF 2.
Winzler and Kelly, Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08932

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08933

ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCE PROJECTS: THE ARMY CORPS OF ENGINEERS,
J. R. Luke.
George Washington Law Review, Vol. 45, No. 5, p 1095-1122 (August, 1977).

Descriptors: *Water resources development, *Environmental effects, *Planning, *Engineers estimates, *Cost-benefit analysis, Water resources, Environment, U.S. Water Resources Council, Recreation, Assessments, Benefits, Legislation, Cost analysis, Project planning, Projects, Comprehensive planning.

This article discusses the role of benefit-cost assessment used by the U.S. Army Corps of Engineers in Corps-initiated water resource development projects and the procedures used to delineate and evaluate projects' environmental impacts. Three sets of requirements dictate the cost-benefit analysis presently used: The Flood Control Act of 1936 requires that all project benefits and costs expressible in monetary units be included in a single cost-benefit ratio: the National Environmental Policy Act of 1969 envisions a descriptive evaluation of the environmental impacts of a proposed project; and Water Resources Council 1973 standards require both a formal cost-benefit analysis and a more loosely structured environmental assessment. While the Corps' present environmental assessment procedures provide a good preliminary framework for evaluating impacts, the article concludes that they fall short of creating a sufficient basis for the decisionmaker to adequately consider

the environment in water resource planning. Impact quantification, a more definitive Congressional statement of a national environmental quality goal, a more comprehensive decision-reasoning requirement, and a de-emphasis on assigning monetary equivalents to anticipated recreational benefits are all recommended in part to improve the Corps' project assessment procedures. (Easterbrook-Florida)
W78-08978

OCS DEVELOPMENT AND THE CONSISTENCY PROVISIONS OF THE COASTAL ZONE MANAGEMENT ACT--A LEGAL AND POLICY ANALYSIS,
Department of the Interior, Washington, DC. Office of the Solicitor.
For primary bibliographic entry see Field 6E.
W78-08980

GUIDELINES FOR EVALUATING PROPOSED WETLANDS ALTERATIONS IN SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept., Columbia.
For primary bibliographic entry see Field 6E.
W78-08987

FLORIDA ENVIRONMENTALLY ENDANGERED LANDS PLAN.
Florida Dept. of Natural Resources, Tallahassee. Div. of Recreation and Parks.
February, 1975. 132 p, 5 fig, 2 tab.

Descriptors: *Florida, *Conservation, *Land management, *Protection, *Public lands, Ecology, Environment, Environmental effects, Environmental engineering, Land classification, Land development, Land reclamation, Land resources, Legal aspects, Legislation, Water resources, Water conservation, Natural resources, Wetlands, Land.

In 1972, the Florida legislature passed the Land Conservation Act (LCA). The purpose of the LCA was to conserve and protect environmentally unique and irreplaceable lands. In compliance with the LCA, Environmentally Endangered Lands (EEL) Plan was prepared. The EEL is based upon the following factors: an analysis of the ecological resources of the state; and an examination of the pressures that adversely affect those resources. The EEL is intended to be a planning tool that establishes policy in the form of criteria and guidelines to assist in achieving the goals of the LCA by means of land acquisition. The EEL establishes six priority categories of land: (1) lands of critical importance to supplies to fresh water for domestic and natural systems; (2) freshwater and saltwater wetlands; (3) unique and outstanding natural areas; (4) natural ocean and gulf beach systems; (5) areas that protect or enhance the environmental values of significant natural resources; and (6) wilderness areas. Because the program lacks the power of eminent domain the total lands acquired are likely to be small. Consequently, most environmental protection in Florida will be achieved through regulation rather than through acquisition. (Jordan-Florida)
W78-08988

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES,
Environmental Protection Agency, Washington, DC. Office of Federal Activities.
For primary bibliographic entry see Field 5G.
W78-08992

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 6 - RESERVOIR INDUCED SEISMICITY,
Woodward-Clyde Consultants, San Francisco, CA.
D. R. Packer, J. R. Lovegreen, and J. L. Born.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 337 p, 14 fig, 4 tab, 312 ref, 6 append. USBR 6-07/DS/72090.

Descriptors: *Reservoir-induced earthquakes, Earthquakes, California, *Earthquake evaluation, Earthquake engineering, *Seimic studies, Pre-impoundment, Seismicity, *Auburn Dam(Calif), Central Valley Project(Calif).

That portion of the study described pertains to any apparent risks at the Auburn damsite for an earthquake induced by the proposed reservoir. The amount of available data and the level of understanding of reservoir-induced seismicity are limited. The estimation for the likelihood of reservoir-induced seismicity at the proposed dam can only be a professional judgement and is based on an understanding of seismicity in the vicinity of the damsite and probability for the August 1975 Oroville earthquake being reservoir-induced. An analysis of the 55 reported cases of reservoir-induced seismicity is presented. Of these, 16 were classified as cases for induced seismicity, 35 as questionable and 4 as not reservoir related. (See also W78-09021) (Bur Reclam)
W78-09026

TOWARD ENVIRONMENTAL DEMAND MANAGEMENT,
Illinois Univ., Urbana-Champaign. Inst. for Environmental Studies.
K. B. Rotzoll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 272, Price codes: A03 in paper copy, A01 in microfiche. IES Report No. 2, (UILU-IES 76 0002), April 1976. 21 p, 15 ref.

Descriptors: *Pollution abatement, *Economics, *Management, *Institutional constraints, Marketing, Regulation, Pricing, Demand, *Demand management, *Environmental management, Corporate responsibility, Market system, Environmental quality.

The purpose is to develop alternative means of encouraging environmentally sound decisions. It is an attempt to elaborate the general social-economic-political environment in which such decisions are made. The report examines the market system and its relationship to the control of environmental quality. The development of the market system is traced from its beginnings to the present. Changes are noted in how our perceptions of human nature, truth, government, and the economy have accompanied a change from the atomistic system of free competition described by classical liberal economists to a market dominated by large concentrations of economic power. These concentrations of power are subject to both the external controls imposed by governments and the internal controls arising from a sense of corporate responsibility. Such a market system is shown to be frequently ineffective in dealing with the environmental problems to which it often contributes. Environmental demand management involves directing the self-interest of both producers and consumers toward environmentally sound choices. It is seen as more effective than direct governmental regulation because of the complexity of environmental problems. (Nessa-NC)
W78-09064

DRAFT ENVIRONMENTAL IMPACT STATEMENT, ASPEN METRO SANITATION DISTRICT, SNOWMASS WATER AND SANITATION DISTRICT--201 WASTEWATER FACILITIES PLANS.
Weiner and Associates, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 589, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Region VIII, Denver, CO, August 1976, 119 p, 3 append.

Descriptors: *Environmental effects, *Waste water treatment, *Domestic wastes, *Water management(Applied), Wastewater disposal, Water quality, Colorado, Non-structural alternatives, Regional analysis, Regional economics, Suspended solids, Ammonia, Tertiary treatment, Pollution, Water pollution control, *Section 201 Facilities Planning, Nonpoint sources, Policy, Resorts, Residual chlorine, Secondary treatment, *Environmental Impact Statement, Aspen(CO), Snowmass(CO), Roaring Fork(CO).

The proposed action will provide for regional wastewater treatment in the combined Aspen and Snowmass resort study areas in Colorado. The study areas' principal river drainage is the Roaring Fork River which is in good condition but is threatened by increased future discharges from point and nonpoint sources. Additionally, present point sources do not have the facilities to meet effluent standards for ammonia, residual chlorine and suspended solids. Specified alternatives have only been proposed for domestic sewage treatment. Nonpoint source control remains an unresolved issue of this draft EIS. Existing facilities are recommended for expanded secondary treatment. Tertiary alternatives are also reviewed. Summertime land treatment was also proposed for both study areas. The proposed facilities will protect the Roaring Fork and Brush Creek. In the Snowmass area this will be achieved by alleviation of pollution from point source discharges; in Aspen the older of two existing plants will be closed, conforming to citizen preference and cost-benefit analysis. The other plant will be correspondingly upgraded and since the net increase in capacity will be minimal, it is not expected that this expansion will be a growth stimulant. The Snowmass facility will also be expanded and this too is not expected to be an inducement for ill-advised growth. Unsolved issues for which remedial measures will be developed prior to the issuance of the final EIS include: development of structural and non-structural policy plans for the control of nonpoint sources; negotiation with land owners for summertime land treatment on designated sites; and an acceptable treatment approach for residual chlorine. (Zayac-NC)
W78-09066

SUMMARY: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE--JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY.
Environmental Protection Agency, Denver, CO. Region VIII.
April 1976. 44 p, 8 tab, 7 fig.

Descriptors: *Environmental effects, *Utah, *Water quality, *Waste water treatment, *Water management(Applied), Waste water(Pollution), Air pollution, Population, Economics, Water rights, Ecology, Management, Water pollution control, *Health effects, *Utah Lake(UT), *Jordan River(UT), *Environmental Impact Statement.

The proposed action is a comprehensive plan for directing future water quality within the Utah Lake-Jordan River hydrologic basins. Alternative wastewater treatment schemes were evaluated in order to best meet water quality standards established by the State of Utah. The planning area includes all or parts of five counties in north-central Utah. The area is presently served by 30 big wastewater treatment plants. Population projections indicate an 80% rise from the 1970 population of 726,488 to 1,304,557 in 1995. About two-thirds of the study area is woodland and for the most part is expected to remain that way. However, agricultural land will be affected by the population increase. Water quality management in each of the five counties is reviewed. Existing facilities and water quality are inventoried, followed by alternative treatment schemes and their water quality effects. Land use effects in each county are then discussed since it is recognized

that implementation of any of the alternatives will affect land use patterns. These effects are classified as direct or indirect. The report then reviews air quality, present and future; economic considerations, both of the construction of facilities themselves and the conversion of agricultural land to urban land over the next 20 years; water right considerations; and the mitigation of possible deleterious impacts. The report concludes with a discussion of the alternative courses of action and identifies two basic alternative policies regarding implementation of the management plan. These policies would reflect either EPA approval of the plan or EPA conditional approval. (Zayac-NC)
W78-09067

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR MARION, NORTH CAROLINA.
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 517, Price codes: A10 in paper copy, A01 in microfiche. 1974, 208 p, 2 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Environmental effects, Water quality, *Water quality control, *Water pollution, *Waste water treatment, North Carolina, Land use, Zoning, Water supply, Waste water(Pollution), Waste water disposal, Dissolved oxygen, Pumping plants, *Marion(NC), *Interceptor sewers, *Force mains, McDowell County(NC), *Environmental impact statement, Traffic flows, Industrial pretreatment.

This environmental impact statement determines the environmental viability of a construction project including a wastewater pumping station, force mains, interceptor sewers and wastewater treatment plant (WWTP) in Marion, McDowell County, North Carolina. The document, after reviewing the social and environmental setting, discusses alternatives ranging among no action, upgrading of existing facilities, assimilative capacities of different reaches and land disposal by crop irrigation system. The proposed action includes the construction of a new 3-mgd WWTP capable of accommodating a 6-mgd expansion with discharge to Corpening Creek. Some pretreatment of industrial wastes will be required. Beneficial impacts include the elimination of the present discharge of inadequately treated wastes, the reduction of the nutrient load to Lake Rhodhiss and improved water quality of both Corpening and Muddy Creeks. Adverse impacts will include the disruption of traffic flows during interceptor and force main construction and erosion during ditching and other earth-moving activities (to be ameliorated by proper construction techniques). The proposed WWTP will have operational safeguards so as not to violate dissolved oxygen standards of the receiving stream. It is expected that judicious use of local land use controls and good zoning practices will contribute to the avoidance of adverse impacts of development that might result from the extension of interceptor sewers. (Zayac-NC)
W78-09068

THE CLYDE ESTUARY AND FIRTH: AN ASSESSMENT OF PRESENT KNOWLEDGE.
Natural Environment Research Council, London (England). Clyde Study Group.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 878, Price codes: A04 in paper copy, A01 in microfiche. Publication Series C, No. 11, May 1974. 62 p.

Descriptors: *Estuaries, *Environmental effects, *Water pollution, Geology, Biology, Chemistry, Sedimentation, Sludge disposal, Excavation, Tidal effects, Sediment transport, Deposition(Sediments), Dredging, Pollutant identification, Nitrogen cycle, Monitoring, Heavy metals, Phytoplankton, Fisheries, Benthos, Pollution(Water), *Clyde Estuary(Scotland), *Firth of Clyde(Scotland), Water movements, Seaweeds.

The Clyde Study was formed to undertake a background appraisal of scientific information available for the Clyde Estuary and Firth. This report aims to gather information to a single locus, to identify gaps in knowledge and to stimulate further research. There has been a long history of industrial development in the upper estuary and it is an area greatly moderated by both the receipt of effluents and wastes, and dredging practices. Generally, though, the Clyde Estuary is revealed to be fairly stable in nature with a bottom composed of fine sediments apparently little reworked. Four general areas are investigated in depth. Geological studies indicate that the basin's deeper waters have a slow sedimentation rate so that dumping of sludge or excavation material may drastically alter the sediment regime. Further study of sediment transport and deposition is recommended. Studies of water movements show a small tidal range with weak tidal currents, indicating a stable system and a need to determine whether this stability is likely to be endangered. The input of fresh water from the area as a whole is moderated by the storage capacity of nearby Loch Lomond; further moderation might be cause for concern. Chemical studies indicate that pollution in the Clyde has three main origins: domestic sewage and industrial effluent; sludge dumping; and the enrichment of areas of the basin through the discharge of nitrogenous effluents. Thus the major pollutants are organic, but heavy metals and other substances are included. The estuarine system has remained stable, but constant monitoring is recommended. Biological studies undertaken indicate a healthy system; constant monitoring practices are recommended to ensure continued biological health. (Zayac-NC)
W78-09070

A PRE-IMPOUNDMENT WATER QUALITY INVESTIGATION FOR THE PROPOSED GATHRIGHT RESERVOIR.
Environmental Protection Agency, Philadelphia, PA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-09072

FINAL ENVIRONMENTAL IMPACT STATEMENT - NORTH FREMONT COUNTY WASTEWATER FACILITIES.
Environmental Protection Agency, Seattle, WA. Region X.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 309, Price codes: A06 in paper copy, A01 in microfiche. Report EPA 910/9-75-013, January 1976, 103 p, append. C-160186-01.

Descriptors: *Environmental effects, *Water quality, *Waste water treatment, *Water management(Applied), Air pollution, Nutrients, Lagoons, Septic tanks, Waste water(Pollution), Aesthetics, Construction, Population, Pollution, Management, Water pollution control, Impacts, Sewage treatment, Noise, Secondary effects, Fecal contaminants, Assimilative capacities, Induced growth, Environmental Impact Statement.

This is an EIS for proposed wastewater facilities for Fremont County, Idaho. The study area includes the entire north half of Fremont County. Since background studies indicate that the waters in this area are being contaminated through the use of inadequate subsurface sewage disposal systems, the proposed sewage treatment systems generally are intended: (1) to provide facilities in those areas of significant existing or projected development to prevent further water contamination; (2) to allow waters to recover their former natural conditions through assimilative action; (3) to preserve the beneficial uses for which the waters have been designated. Existing facilities in the study area include one evaporative lagoon, with the rest of the treatment systems being individual home septic tanks. Conditions in the planning area without the project are inventoried; environmental impacts of the proposed action are then discussed. Water quality of the area is expected to be improved by the removal of human fecal contaminants and through the restoration of the area's streams' assimilative capacities; negative impacts include some loss of nutrients. Construction activities will produce some adverse impacts. Adverse aesthetic impacts and adverse operation impacts will be minimized by proper site design. Secondary impacts will include the increased likelihood of population growth and further development in the area. The relationship between local short term uses of man's environment and the maintenance and enhancement of long term productivity is studied by investigating tradeoffs between construction impacts vs. improved water quality; improved water quality vs. induced growth; and implementation vs. delay (including no action). Outside participation is summarized, followed by comments to the draft EIS and responses. (Zayac-NC)
W78-09073

PRODUCTIVITY RELATIONS IN A CAREX-DOMINATED ECOSYSTEM,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-09081

MAN'S INFLUENCE ON THE DEVELOPMENT OF THE ESTUARINE MARSH, FLAX POND, LOND ISLAND, NEW YORK,
New York Univ., NY. Dept. of Biology.
L. E. Heusser, C. J. Heusser, and D. Weiss.
Bulletin of the Torrey Botanical Club, Vol. 102, No. 2, p 61-66, March-April, 1975. 4 fig, 22 ref.

Descriptors: *Channeling, *Salt marshes, *Cores, Pollen, Peat, Marshes, Estuaries, Paleoecology, *Flax Pond(NY).

Paleoecological changes during the past 1,730 radiocarbon years at Flax Pond are interpreted from plant macrofossils, pollen, spores, dinoflagellates, and formaminifers contained in seven cores. Three pollen assemblage zones are recognized: (1) Gramineae-Chenopodiaceae-Ruppia spanning approximately the last century, (2) Polypodiaceae-Cyperaceae-Compositae-Typha of unknown duration, and (3) Compositae-Gramineae constituting the early record. During the interval of zone 3, Flax Pond originated as an estuary; in zone 2, sedge, fern, and sphagnous remains in the peat point toward conditions that varied between fresh water and oligohaline. Man's apparent opening of the baymouth bar (blocking Flax Pond from Long Island Sound) in the 19th century (zone 1) brought about a sudden change to mesohaline conditions causing deposition of Spartina alterniflora peat and a sharp increase in arenaceous foraminifers, Trochammina inflata and Ammobaculites sp. Since the 1800's, fossil evidence indicates that ditching and dredging of the marsh have maintained salinities ranging between 5 and 26 ppt. (Stihler-Mass)
W78-09091

CONSERVATION OF COASTAL HABITATS OF WADERS IN THE SOUTH-WESTERN CAPE, SOUTH AFRICA,
Cape Town Univ. (South Africa). Percy Fitz-Patrick Inst. of African Ornithology.
For primary bibliographic entry see Field 2L.
W78-09101

THE CRANESVILLE PINE SWAMP,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 2H.
W78-09107

ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE. VOLUME 1: TREND IDENTIFICATION AND EVALUATION,
Development Planning and Research Associates, Inc., Manhattan, KS.
For primary bibliographic entry see Field 2G.
W78-09149

THE USE OF SYSTEMS DIAGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT: PROCEDURES AND AN APPLICATION,
Oklahoma Univ., Norman. Science and Public Policy Program.
M. W. Gilliland, and P. G. Risser.
Ecological Modelling, Vol 3, No 3, August 1977, p 183-199. 7 fig, 1 tab.

Descriptors: *Environmental effects, *Systems analysis, *Systems diagrams, *Energy, *White Sands Missile Range(NM), *Planning, New Mexico, Model studies, Mathematical models, Simulation analysis, Water pollution control, Aquifers, Saline water intrusion, Methodology, Analytical techniques, Aquifer management, Data processing.

The utility of systems diagrams and of energy flow per unit time as the measure for environmental impact assessment is illustrated using results from the environmental impact statement for White Sands Missile Range, New Mexico. Procedures for developing and evaluating the diagrams are given and applied to White Sands. Both large-scale and small-scale environmental effects of the missile range were evaluated: On a macro scale, environmental stresses represented 1% of the natural energy flow through the system. At a more detailed level, a hydrological model used to assess effects of missile range water consumption on the aquifer showed that salt water intrusion into the aquifer was imminent, and identified two management strategies to prevent the intrusion. Environmental impact analysis includes: (1) evaluating total impact; (2) comparing alternatives; (3) organizing, summarizing, and synthesizing voluminous data; and (4) communicating results to the public and to decision-makers. A procedural approach incorporating models to organize information greatly facilitates such analysis. The thesis of this paper is that macroscale models, required to put various effects into perspective, need not be simulated to be useful. Rather, their utility is in synthesizing ideas, organizing information, guiding data collection, comparing effects, directing microscale analysis (at a level where simulation is valuable), and communicating results. (Lynch-Wisconsin)
W78-09174

LAKE ERIE AIRPORT STUDY,
Howard, Needles, Tammen and Bergendoff, Cleveland, OH. Cleveland Aviation Office.
H. R. Crawford.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 103, No. TE3, p 321-335, March 1977. 9 fig, 14 ref.

Descriptors: *Great Lakes, *Offshore structures, *Underwater construction, *Airports, *Environmental impact statements, Coastal engineering, Shore protection, Dikes, Urban planning.

Completed investigations include weather studies, Lake Erie bottom soils surveys, and environmental surveys of Lake waters and sediments. Weather, noise levels, air and water quality impacts, airspace/air traffic control considerations, obstruction clearances, effects on Lake currents and Lake navigation routes, and aesthetic considerations have been evaluated. The feasibility of dividing airport functions between the offshore site and onshore facilities has been studied, facility requirements have been developed, and airport layout schematics formulated. Potential construction configurations have been analyzed. Construction materials availability and transport methods are being investigated, alternative construction methods are being studied, and cost-effectiveness evaluations have been initiated. Environmental impacts and legal questions are under intensive study. Future work includes function/selection, access planning, cost-benefit analyses, financial planning, further environmental impacts, and final feasibility analysis. Completion of the in-Lake portion of the study is scheduled for late 1976. (Bell-Cornell)
W78-09186

RECENT AND PLANNED MARSH ESTABLISHMENT WORK THROUGHOUT THE CONTIGUOUS UNTED STATES-A SURVEY AND BASIC GUIDELINES,
Environmental Concern, Inc., St. Michaels, MD.
For primary bibliographic entry see Field 2I.
W78-09217

TECHNOLOGICAL-FORCING AND FEDERAL ENVIRONMENTAL PROTECTION STATUTES,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W78-09245

THE USE OF CATCHMENT AREAS AS FLORA AND FAUNA RESERVES,
National Parks, Victoria (Australia).
L. H. Smith.
Water Research Foundation of Australia, Report No. 37, Water Catchment Management and Recreational Use, p. 4.1-4.8, December 1972. 8 ref.

Descriptors: *Watershed management, *Victoria(Australia), *Wildlife management, *Watersheds(Basins), Melbourne(Australia), Land use, Wildlife habitats, Ecology, Forestry, Recreation demand, Water supply, Grazing, Environmental effects, Multiple purpose, Single purpose, Mountains.

Planning considerations for wildlife reserves within water supply catchments in the State of Victoria, Australia are discussed. Victoria has two types of catchments: (1) those controlled by the Melbourne and Metropolitan Board of Works for supplying water to the city, and (2) water resources outside the Melbourne area, controlled by the State Rivers and Water Supply Commission. A major differentiation is that the MMBW has statutory control of catchment lands, while the commission's reservoirs are supplied by catchments controlled by other agencies. Watersheds of Victoria provide exceptionally good bases for flora and fauna reserves because of their rich and diverse wildlife. Mere designation of reserves would achieve little and could create major problems; land management is required for reserves viewed in a development sense. Due to MMBW's policy of single-use catchments, such managed reserves are not possible in its jurisdiction. Major catchments in Victoria not controlled by MMBW and therefore subject to multiple use are Mount Bogong, Bogong High Plains, Mts. Hotham/Loch/Feather-top, Mount Howitt/Snowy Plains, and the Baw Baws. Factors which affect the future of these areas as wildlife reserves include: (1) forestry; (2) grazing, which causes more damage at higher elevations; (3) snow sports, especially ragarding ancillary services; and (4) motorized recreational vehicles. (See also W78-09247) (Lynch-Wisconsin)
W78-09251

7. RESOURCES DATA

7A. Network Design

RIVER BASIN NETWORK MODELLING AND ITS APPLICATION TO THE TISZA RIVER BASIN,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09191

7B. Data Acquisition

SOME METHODS AND INSTRUMENTS FOR AUTOMATED MONITORING OF THE CHEMICAL COMPOSITION OF SURFACE WATERS,
Hydrochemical Inst. Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W78-08812

PROBLEM OF ESTIMATING THE RELIABILITY OF INFORMATION OBTAINED BY AN AUTOMATED WATER QUALITY MONITORING AND CONTROL SYSTEM,
Hydrochemical Inst. Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W78-08813

LOW-SPEED CALIBRATION OF THE BENDIX Q15R CURRENT METER,
Argonne National Lab., IL. Energy and Environmental Systems Div.
K. D. Saunders.
Journal of Great Lakes Research, Vol 3, No 3-4, p 317-320, December 1977. 5 fig, 1 tab, 2 ref. ERDA W-31-109-ENG-38, suppl. 18.

Descriptors: *Current meters, *Calibrations, *Laboratory tests, *Flow measurement, Instrumentation, Velocity, Currents(Water), Measurement, Analysis, Analytical techniques, Quality control, Equipment, Rotating meters, Bendix Q15R current meter.

Recent calibrations of the Bendix Q15R ducted impeller current meter showed a strong non-linear relationship between the observed count rate conversion factor and the true water speed in the range 0.0-0.1 m/s. An empirical response curve was fitted (using least squares) to the data, and the fitted coefficients were presented for all current meters calibrated by Argonne National Laboratory. Separate calibrations of every current meter were recommended wherever possible. If this is not possible, use of the composite fitted curve was recommended in preference to the manufacturer's conversion factor. The use of the constant nominal conversion factor supplied by the manufacturer is justified only when the currents are greater than about 0.1-0.2 m/s. (Humphreys-ISWS)
W78-08824

MONITORING POLLUTION.
For primary bibliographic entry see Field 5B.
W78-08878

AN ON-LINE COMPUTERIZED INFRARED IDENTIFICATION SYSTEM,
Beckman Instruments, Inc., Irvine, CA. Scientific Instruments Div.
For primary bibliographic entry see Field 5A.
W78-08944

AMERICAN DEVELOPMENTS IN HYDRAULIC MEASUREMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W78-09036

MAPPING WETLANDS ON BEAVER FLOWAGES WITH 35 MM PHOTOGRAPHY,
Southern Illinois Univ., Carbondale. Cooperative Wildlife Research Lab.
For primary bibliographic entry see Field 7C.
W78-09087

LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE FORM ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. Hayden, J. Heywood, J. Michel, and K. Schroeder.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-19551, Price codes: A01 in paper copy. Quarterly Report for Period 1/1/77 to 3/1/77. Prepared for NASA/Goddard Space Flight Center, Greenbelt, Maryland. 1977. 8 p.

Descriptors: *Shores, *Aerial photography, Erosion, Beaches, Coasts, *LANDSAT, *Assateague Island(MD VA), Maryland, Virginia.

Data on beach-zone width, swash slope, and sand-grain size were collected at 89 locations along Assateague Island (MD/VA). Correlations were run among these data sets and for coastal orientation and historical shoreline erosion. The analysis indicates that there are organized relationships between physical beach features and shoreline form and erosion, but weak relationships between sand-grain size and shoreline form and erosion. (Stihler-Mass)
W78-09093

A METHOD OF MEASURING SALT MARSH INUNDATION,
Aarhus Univ. (Denmark). Botanical Inst.
A. Jensen.
Oikos, Vol. 25, No. 3, p 252-254, 1974. 4 fig, 5 ref.

Descriptors: *Tidal marshes, *Salt marshes, *Tides, Methodology, Wetlands, *Measurement, *Inundation, Marshes.

A system for measuring the period of inundation of permanent plots is described and some results from Skallingen salt marsh, SW Jutland reported. The basic component of the system is a 10-channel event recorder with a stabilized electrical part of advancing the paper. A sensor is placed in the ground in such a way that it is activated when the water reaches a certain level and will stay activated until the water falls below that level. Results indicate that it is necessary to measure inundation at each investigation site. (Stihler-Mass)
W78-09098

EVALUATION OF A WATER ANALYSIS KIT,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-09111

CLOVER N-FIXATION MEASUREMENT BY TOTAL-N DIFFERENCE AND 15N A-VALUES IN LYSIMETERS,
California Univ., Davis. Dept. of Agronomy and Range Science.
W. A. Williams, M. B. Jones, and C. C. Delwiche.

Descriptors: *Nitrogen fixation, *Legumes, Lysimeters, *Clovers, California, Crop production, Crop response, Nitrogen, Nitrogen-15, Measurement.

Assessment and improvement of N fixation by legumes on annual-type range is becoming increasingly important in light of the increasing need for energy conservation. A comparison was made of two methods of assessing N fixation: a simple but crude method by measuring the total-N difference in tops of an N-fixing legume and a non N-fixing grass, and a more expensive method using A-values determined from 15N applications to the same legume and grass species. Subterranean clover and soft chess grass were grown in field lysimeters (69 cm deep by 36 cm diam.) filled with Josephine loam (Typic Haplozerults, fine loamy, mixed mesic) for 3 years. Single (100 and 500 kg/ha) and repeated (100 kg/ha) applications of 15N were made and determinations were made of soil and fertilizer N in plants, soil, and leachate periodically. The relation between the two methods was strongly linear; fixation (kg/ha) by the A-value method = 50.1 + 0.852 N fixation by difference ($r = 0.98$, $n = 15$). Consequently, previous values cited for N fixation measured by the difference method for winter annual legumes in California may have been underestimated by about 40%. (Skogerboe-Colorado State)
W78-09121

DIGITAL ELECTRONIC MEASUREMENT AND RECORDING OF IRRIGATION FIELD WATER DEPTHS,
ICE Corp., Manhattan, KS.
For primary bibliographic entry see Field 3F.
W78-09125

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
For primary bibliographic entry see Field 4A.
W78-09138

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUALIFICATION,
National Aeronautics and Space Asministration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-09166

SELECTING RECONNAISSANCE STRATEGIES FOR FLOODPLAIN SURVEYS,
Army Engineer District, San Francisco, CA.
S. C. Sollers, A. Rango, and D. L. Henninger.
Water Resources Bulletin, Vol. 14, No. 2, p 359-373, April 1978. 2 fig, 2 tab, 34 ref. Army DACW 73-74-C-0036, NASA S-50960-G.

Descriptors: *Remote sensing, *Floodplains, *Surveys, *Pennsylvania, Satellites(Artificial), Aircraft, Planning, Rivers, Flood plain zoning, Flood plain insurance, Flood data, Costs, On-site investigations, Classification, Mapping, Hydrology, LANDSAT.

Multispectral aircraft and satellite data over the West Branch of the Susquehanna River were analyzed to evaluate potential contributions of remote sensing to floodplain surveys. Multispectral digital classifications of land cover features indicative of floodplain areas were used by interpreters to locate various floodprone area boundaries. The boundaries thus obtained were found to be more striking and continuous in the LANDSAT data than in the low altitude aircraft data. The digital approach permitted satellite results to be displayed at 1:24,000 scale and aircraft results at even larger scales. Results indicated that remote sensing techniques can delineate floodprone areas more easily in agricultural and limited development areas than in areas covered by a heavy forest canopy. At this time it appears that the remote sensing data would be used best as a form of preliminary planning information or as an internal check on previous or ongoing floodplain studies. In addition, the remote sensing techniques can assist in effectively monitoring floodplain activities after a community enters into the National Flood Insurance Program. (Sims-ISWS)
W78-09207

AERIAL PHOTO INTERPRETATION OF A SMALL ICE JAM,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-09215

RAINFALL SIMULATOR FOR EVALUATING EROSION RATES AND SEDIMENT FROM ROW SIDESLOPES,
Agricultural Research Service, oxford, MS. Sedimentation Lab.
L. D. Meyer, and W. C. Harmon.
Paper No. 77-2025, presented at the 1977 Annual Meeting, American Society of Agricultural Engineers, June 26-29, 1977. Raleigh, North Carolina, 12 p, 9 fig, 8 ref.

Descriptors: Rainfall, Simulation analysis, *Rainfall simulators, Runoff, Erosion rates, Sediments, Sedimentation, *Soil erosion, *Slopes.

A new rainfall simulator was developed for obtaining data on row-sideslope runoff, erosion, and sediment size. It can apply a wide range of intensities at impact energies comparable to those of natural rainfall. Design features, simulated-ranifall characteristics, and example data are reported. (Skogerboe-Colorado State).
W78-09253

SELF-CLEANING SCREEN FOR PROCESSING BENTHIC SAMPLES,
Fish and Wildlife Service, Jamestown, ND. Northern Prairies Wildlife Research Center.
G. A. Swanson.
The Progressive Fish Culturist, Vol 39, No 4, p 177-178, October 1977. 2 fig, 3 ref.

Descriptors: *On-site Data collections, Equipment, *Sampling, *Benthos, *Screens, Design, Filters, Sieves, On-site investigation, Methodology, Laboratory equipment.

A screen is described that allows the processing of large amounts of material in a relatively short period without clogging. The apparatus is constructed from two pieces of plywood that are rounded at one end and joined on three sides by screen of the desired mesh size. Flotation material maybe attached to provide bouyancy. The half-round design causes one side of the screen to be cleaned while the other side screens the sample. (EIS-Katz)
W78-09291

DURABLE ICHTHYOPLANKTON SAMPLER FOR SMALL BOATS,
Maryland Univ., Frostburg. Appalachian Environmental Lab.
J. E. Cooper.
The Progressive Fish Culturist, Vol 29, No 4, p 170-171, October 1977. 3 fig, 7 ref.

Descriptors: *Sampling, Equipment, *Design, *Specification, *Plankton nets, *On-site data collections, Plankton, Research equipment, Boats, Zooplankton, Freshwater fish, *Ichthyoplankton samplers.

Half-meter ichthyoplankton sampling gear for simultaneous two-level sampling is described and illustrated. The gear is designed for use with boats up to 8 m long, at speeds less than 2.5 m/s. The gear is light and durable, and can be easily transported without disassembly. (EIS-Katz)
W78-09292

7C. Evaluation, Processing and Publication

RECONSTRUCTION OF RIVER DISCHARGES IN THE CONGO BASIN,
Moscow State Univ. (USSR). Dept. of Hydrology.

For primary bibliographic entry see Field 2E.
W78-08814

A MODEL TO DESCRIBE THE INHERENT SPATIAL AND TEMPORAL VARIABILITY OF PARAMETERS IN LAKE ONTARIO 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-08817

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1977.
Geological Survey, University, AL. Water Resources Div.
Water-Data Report AL-77-1, February 1978. 459 p, 7 fig.

Descriptors: *Alabama, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Alabama consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoir; and water levels in wells. This report contains discharge records for 92 gaging stations, stage only for 25 gaging stations, stage and contents for 12 lakes and reservoir, water quality for 61 gaging stations and water levels for 52 observation wells. Also included are 26 crest-stage partial-record stations, 10 flood hydrograph partial-record stations, and 33 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alabama. (Woodard-USGS)
W78-08836

WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, MAY 1977,
Geological Survey, Tallahassee, FL. Water Resources Div.
P. D. Ryder, and L. R. Mills.
Open-file report 77-642, 1977. 15 p, 4 maps, 2 fig, 1 tab.

Descriptors: *Aquifers, *Water levels, *Mapping, *Potentiometric level, *Water table, Hydrographs, Florida, *Floridan aquifer, *Surficial aquifer, Pasco County, Pinellas County, Hillsborough County.

The coastal parts of Pasco, Pinellas and Hillsborough are undergoing extensive urban development. The Floridan aquifer is the area's principal water supply. Potentiometric and water-table maps were prepared in order to determine the effect of groundwater withdrawals in selected well fields in west-central Florida. These maps were prepared in May 1977 to capture the annual low-water-level period. Declines in the potentiometric surface ranged from 3 feet in the Starkey well field to 25 feet in the Sun City well field. (Woodard-USGS)
W78-08843

WATER RESOURCES DATA FOR KENTUCKY, WATER YEAR 1977.
Geological Survey, Louisville, KY. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 738, Price codes: A18 in paper copy, A01 in microfiche. Water-Data Report KY-77-1, March 1978. 390 p, 4 fig, 3 tab, 22 ref.

Descriptors: *Kentucky, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Kentucky consist of records of stage, discharge, and water quality of streams; stage and contents of lakes; and water levels and water quality of wells and springs. This report contains discharge records for 116 gaging stations; stage and contents for 14 lakes; water quality for 51 gaging stations, 13 water-quality stations, 26 miscellaneous stations, and 34 wells and springs; and water levels for 82 observation wells. Also included are data for 127 crest-stage partial-record stations and 131 low-flow partial record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous sites. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Kentucky. (Woodard-USGS)
W78-08844

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1977.
Geological Survey, Huron, SD. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 757, Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report SD-77-1, March 1978. 291 p, 6 fig.

Descriptors: *South Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for South Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 97 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 26 gaging stations and 148 wells; and water levels for 16 observation wells. Also included are 100 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in South Dakota. (Woodard-USGS)
W78-08845

LOW-FLOW CHARACTERISTICS OF PENNSYLVANIA STREAMS,
Geological Survey, Harrisburg, PA. Water Resources Div.
L. V. Page, and L. C. Shaw.
Pennsylvania Department of Environmental Resources, Harrisburg, Water Resources Bulletin No 12, October 1977. 441 p, 21 fig, 1 tab, 2 ref.

Descriptors: *Low flow, *Flow duration, *Streams, *Pennsylvania, *Low-flow frequency, Flow rates, Data collections, Gaging stations, Measurement, Sites, Maps, Continuous-record sites, Partial-record sites, Miscellaneous-record sites.

This report presents the frequency of low flow and duration of flow for 1,210 sites on streams in and adjacent to Pennsylvania. The amount of data collected varies from the complete daily discharge records of the continuous-record gaging stations, some of which have been in operation for many years, to the miscellaneous sites, where only a few discharge measurements have been made. Daily discharges for all the continuous-record stations with five or more years of record have been summarized by electronic computer. Through the use of these statistical summaries, low-flow tables for all unregulated streams with 10 or more years of record and flow-duration tables for all streams with 5 or more years of record have been compiled. The annual minimum mean discharges for 7 consecutive days having recurrence intervals of 2 and 10 years, are given where possible for continuous-record stations with less than 10 years of record, for partial-record stations, and for miscellaneous measurement sites. (Woodard-USGS)
W78-08846

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1977,
Geological Survey, Helena, MT. Water Resources Div.
R. J. Omang, and J. A. Hull.
Open-file report 78-219, March 1978. 202 p, 2 fig.

Descriptors: *Peak discharge, *Montana, *Streams, *Crest-stage gages, *Small watersheds, Streamflow, Flow rates, Flood peak, Flood frequency.

Annual peak stage and stream-discharge data have been collected and tabulated for crest-stage gaging sites in Montana. The crest-stage program was begun in July 1955 to investigate the magnitude and frequency of floods from small drainage areas. The program has expanded from 45 crest-stage gaging stations initially to 191 stations in 1977. Data are tabulated for 336 sites throughout the period of record. (Woodard-USGS)
W78-08847

ALTITUDE AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER, DUVAL COUNTY, FLORIDA,
Geological Survey, Jacksonville, FL. Water Resources Div.
G. W. Leve.
Water-Resources Investigations 77-114 (open-file report), 1978. 1 sheet, 1 ref.

Descriptors: *Subsurface mapping, *Hydrogeology, *Aquifers, *Structural geology, *Florida, Faults(Geologic), Stratigraphy, Limestones, Water wells, Duval County(Fla), Jacksonville(Fla), *Floridan aquifer.

Structural contours on the top of the Floridan aquifer in Duval County, Florida, show that the top of the aquifer ranges from less than 300 feet below sea level to more than 600 feet below sea level. Two inferred concealed faults occur in the aquifer; one trending northeast-southwest in the eastern part of the county. The maximum vertical displacement of the top of the aquifer of both faults is about 150 feet. A geologic section included on the map shows the geologic formations of Eocene age that comprise the Floridan aquifer. These are, in ascending order: the Lake City Limestone, the Avon Park Limestone, and the Ocala Limestone. (Woodard-USGS)
W78-08855

THE WINONA-TALLAHATTA AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, MS. Water Resources Division.
G. A. Spiers.
Water Resources Investigations 77-125 (open-file report), 1977. 2 sheets, 11 fig, 2 tab, 19 ref.

Descriptors: *Groundwater resources, *Mississippi, *Aquifer characteristics, *Water wells, *Water quality, Groundwater recharge, Water yield, Water users, Water levels, Maps, *Tallahatta Formation, Eocene aquifers, Claiborne Group.

This aquifer atlas describing the Winona-Tallahatta aquifer is the seventh in a series prepared in cooperation with the Mississippi Board of Water Commissioners. The atlas summarizes the large amount of unpublished data available in the files of the U.S. Geological Survey and it describes the extent, character, and present utilization of the aquifer and its potential for additional development. The Winona-Tallahatta aquifer, which contains freshwater having less than 1,000 mg/liter of dissolved solids in about 25 percent of the State occurs in northwestern and central Mississippi. The water-bearing zones extend into Tennessee and become part of the Memphis aquifer. In Arkansas and Louisiana the aquifer is in the Cane River Formation. The Tallahatta Formation which is the basal unit of the Claiborne Group includes, in ascending order, the Meridian Sand, Basic City Shale, and Neshoba Sand Members. The Winona-Tallahatta aquifer is the source of water for only a few large water users, but is the source of water for hundreds of small-yield domestic and stock wells less than 200 feet deep. Total water use in the State in 1977 from the Winona-Tallahatta is estimated to be about 3 mdg. (Woodard-USGS)
W78-08856

EFFECT OF PROCESS MODIFICATIONS ON THE REDUCTION OF WATER USE AND WASTE IN A CASE STUDY DAIRY PLANT,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 3E.
W78-08890

FINITE ELEMENT MODELING OF UNSATURATED FLOW,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08915

INFRARED SPECTRA OF PETROLEUM - DATA BASE INFORMATION AND APPLICATION TO REAL SPILLS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-08943

THE FUTURE OF MINI-COMPUTERS AND MICROPROCESSORS IN INFRARED ANALYSIS,
The Perkin-Elmer Corp., Norwalk, CT.
For primary bibliographic entry see Field 5A.
W78-08946

EVALUATION OF EVAPORATION FROM LAKE ONTARIO DURING IFYGL BY A MODIFIED MASS TRANSFER EQUATION,
Atmospheric Environment Service, Downsview (Ontario). Hydrometeorology and Marine Applications Div.
For primary bibliographic entry see Field 2D.
W78-09039

WATER CONDITIONS IN CALIFORNIA, SUMMARY OF CENTRAL VALLEY WATER CONDITIONS, JUNE 1, 1978.
Sacramento Dept. of Water Resources, CA.
For primary bibliographic entry see Field 4A.
W78-09050

COASTAL BARRIER CHANGES, 1770-1867, BISCAYNE BAY AREA, FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2L.
W78-09053

ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1976,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W78-09060

FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME II, MORGAN COUNTY - WASHINGTON COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
For primary bibliographic entry see Field 4A.
W78-09074

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, REDDING, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-09075

FLOOD PLAIN INFORMATION: TRINITY RIVER, LEWISTON LAKE TO JUNCTION CITY, TRINITY COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-09076

MAPPING WETLANDS ON BEAVER FLOWAGES WITH 35 MM PHOTOGRAPHY,
Southern Illinois Univ., Carbondale. Cooperative Wildlife Research Lab.
R. E. Kirby.
Canadian Field-Naturalist, Vol 90, No 4, p 423-431, October-December, 1976. 3 fig, 3 tab, 24 ref.

Descriptors: *Mapping, *Photography, *Remote sensing, *Wetlands, *Beavers, Maps, Vegetation, Methodology, Cover types, *Minnesota, National forests, Chippewa National Forest(Minn).

Beaver flowages and associated wetlands on the Chippewa National Forest, north-central Minnesota, were photographed from the ground and from the open side window of a small high-wing monoplane. The 35-mm High Speed Ektachrome transparencies obtained were used to map cover-type association visible on the aerial photographs. Nearly vertical photographs were rectified by projecting the slides onto a base map consisting of control points located by plane-table survey. Maps were prepared by tracing recognizable stands of vegetation in the rectified projection at the desired map scale. Twenty-six cover-type associations were identified and mapped on 10 study flowages in 1971. Comparative data from 10 flowages were collected serially throughout the entire openwater season. This cover-mapping technique was economical and substituted for detailed ground surveys. (Stihler-Mass)
W78-09087

COMPUTERIZED DESIGN AND ANALYSIS OF SPRINKLER IRRIGATION SYSTEMS,
Maine Univ. at Orono. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09127

RIVER BASIN NETWORK MODELLING AND ITS APPLICATION TO THE TISZA RIVER BASIN,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-09191

CHARACTERIZING LOW FLOWS USING THRESHOLD LEVELS,
Lehigh Univ., Bethlehem, PA. Fritz Engineering Lab.
For primary bibliographic entry see Field 2E.
W78-09202

AUTOMATIC ANALYSIS OF PUMPING TEST DATA-APPLICATION TO THE BOULTON AND HANTUSH HYPOTHESES (ANALYSE AUTOMATIQUE DES DONNEES DE POMPAGE D'ESSAI-APPLICATION AUX HYPOTHESES DE BOULTON ET D'HANTUSH),
Lille-1 Univ., Villeneuve d'Ascq (France).
For primary bibliographic entry see Field 2F.
W78-09205

MODEL FOR SIMULATING SOIL-WATER CONTENT CONSIDERING EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-09206

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION. APPENDIX A: SAN FRANCISCO BAY SAMPLING DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects lab.
For primary bibliographic entry see Field 5B.
W78-09225

SOME PROBLEMS IN ANALYSING AND FORECASTING WATER DEMAND,
For primary bibliographic entry see Field 6D.
W78-09246

EVALUATION OF THE COMPONENTS OF THE USDAHL-74 MODEL OF WATERSHED HYDROLOGY,
Agricultural Research Service, Boise ID.
For primary bibliographic entry see Field 2A.
W78-09258

A CONTINUOUS WATER BUDGET MODEL FOR WESTERN KANSAS,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 2G.
W78-09263

8. ENGINEERING WORKS

8B. Hydraulics

WAVE FORCES ON MULTIPLE VERTICAL CYLINDERS,
Chicago Bridge and Iron Co., Plainfield, IL. Marine Research and Development.
S. K. Chakrabarti.
Journal of the Waterway, Port, Coastal and Ocean, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13727, p 147-161, May 1978. 15 fig, 7 ref.

Descriptors: *Waves(Water), *Hydrodynamics, *Piles(Foundations), Numerical analysis, Offshore platforms, Potential flow, Hydraulics, Equations, Mathematical studies, *Linear systems, Cylinders, Complex variables, Wave pressure.

Interaction of waves with a group of vertical cylinders was investigated. The inter-scattering of the waves from various cylinders was taken into consideration in the analysis. A direct solution was obtained through a matrix inversion. The forces on a

cylinder due to linear waves in the presence of other cylinders were evaluated. This method may be applied to design large multi-legged offshore platforms where drag effects are negligible. The theory has received some experimental verification. Numerical results also were presented for various platform configurations to show the effect of the presence of the neighborhood cylinders on the wave forces on a vertical cylinder. The results were compared with the single cylinder solution. (Lee-ISWS)
W78-08801

HYDRODYNAMIC DRAG FORCES ON GROUPS OF FLAT PLATES,
Manchester Univ. (England). Simon Engineering Labs.
D. J. Ball, and N. J. Cox.
Journal of Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13736, p 163-173, May 1978. 8 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Drag, *Piers, *Hydraulic models, Flumes, Model studies, Harbors, Hydrodynamics, Navigation, Ships, Estuaries, Laboratory tests, *Plates(Structural members).

The hydrodynamic drag on a rectangular group of 50 flat plates, with steady incident flow normal to the front of the group was shown to be a function of five factors: (1) the acceleration of flow between the plates of a row; (2) the shielding of plates in line with the incident flow; (3) the diversion of flow around the front of the group; (4) the rejection of flow through the sides of the group; and (5) the formation within the group of an oscillating wake for the whole group. The drag force on each element of the group was measured for longitudinal and lateral spacings covering the range occurring in existing pier head pile groups that the flat plates simulated. (Sims-ISWS)
W78-08802

FINITE ELEMENT MODELLING OF NEARSHORE CURRENTS,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
P. L-F. Liu, and G. P. Lennon.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13719, p 175-189, May 1978. 9 fig, 3 tab, 12 ref, 2 append.
NSF ENG75-09421,NOAA 44-SO43-C, 44-SO51-C.

Descriptors: *Waves(Water), *Shores, *Rip currents, *Model studies, Mathematical models, Finite element analysis, Ocean waves, Coasts, Currents(Water), Beaches, Topography, Beds, Roughness(Hydraulic), Oceanography, Coastal engineering, Shore-line cover, Littoral current.

A finite element model was developed to compute the nearshore currents induced by breaking waves in the surf zone. The normal incident wave system was employed so as to study the effects of beach topography on the current circulation patterns. The beach topography considered here was of linear plane beach shape with minor undulations in the longshore direction. Ignoring the lateral turbulent diffusion, the finite element representation of the governing equations of mean currents was obtained by the method of weighted residuals. It was shown that, due to the flexible grid discretization, this model can be used to study problems containing more complex beach topography within a large area of interest. Two types of alongshore beach undulations were investigated: rhythmic topography and localized irregular topography. The locations of rip currents depend on the surf zone width and the on-offshore variation of beach profile. (Sims-ISWS)
W78-08803

VIRTUAL MASS OF COARSE GRANULAR MEDIA,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
A. A. Hannoura, and J. A. McCorquodale.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13734, p 191-200, May 1978. 6 fig, 2 tab, 28 ref, 2 append.

Descriptors: *Breakwaters, *Rocks, *Hydrodynamics, *Laboratory tests, Porous media, Unsteady flow, Mass, Darcys law, Reynolds number, Flow, Hydraulics, Theoretical analysis, Coastal engineering, Granular media, Inertia.

An experimental study to determine the effect of unsteady flow in the hydraulic conductivity of coarse granular porous media was outlined. The acceleration effect was expressed in terms of two variables, i.e., acceleration coefficient, which is function of the well-known inertia coefficient, and the instantaneous flow acceleration. The inertia coefficient was found by comparing the resistance of both steady and unsteady flows through the same porous matrix. The results were given in two forms to show the effect of the unsteady flow on the hydraulic resistance and to show the variation of the inertia coefficient with Reynolds number. The experimental results showed that virtual mass effect does exist in coarse granular porous media, which is the usual construction material for rubble-mound breakwaters. Also, it was found that the acceleration effect becomes more important for large grain porous media, e.g., of particule sizes equal or larger than 40 mm. (Sims-ISWS)
W78-08804

MASS TRANSPORT IN SHALLOW WATER WAVES,
British Columbia Univ., Vancouver Dept. of Civil Engineering.
M.de St.Q. Isaacson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13774, p 215-225, May 1978. 4 fig, 18 ref, 2 append.

Descriptors: *Mass transfer, *Waves(Water), *Shallow water, *Model studies, Mathematical models, Theoretical analysis, Laboratory tests, Sediment transport, Shores, Coasts, Flow, Unsteady flow, Velocity, Boundary layers, Hydrodynamics, Coastal engineering.

The mass transport velocity near the seabed has been calculated previously to first and second approximations for both Stokes and cnoidal waves. A set of curves based on these predictions was presented in a convenient form and permitted a ready estimate of the bottom mass transport for any given conditions. Experiments conducted to test the predictions were described. These, as well as previous experiments, indicated reasonable agreement with the theoretical predictions. Although the onset of turbulence limits the range of validity of the curves, they may still be used but with less reliability. The condition for transition to a turbulent boundary layer adopted by some authors was found to be questionable. (Sims-ISWS)
W78-08805

WAVE SETUP AND DESIGN WATER LEVEL,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
U. A. Hansen.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineering, Vol. 104, No. WW2, Proceedings Paper 13776, p 227-240, May 1978. 16 fig, 2 tab, 22 ref, 2 append.

Descriptors: *Shore protection, *Dikes, *Waves(Water), *Water levels, Shores, Coasts, Beaches, Ocean waves, On-site investigations, Tides, Seashores, Design, Coastal structures, Coastal engineering, Wave heights.

During the winter of 1975-76, measurements were made by the Leichtweiss-Institut of the Technical University of Braunschweig at the west coast of the island of Sylt in the North Sea. The purpose of the field investigations was to determine the wave-induced setup in the surf zone and on the beach, defined as the height difference between the mean water level (MWL) and the still water level (SWL) and the influence of typical offshore parameters on this phenomenon. A new scheme was defined to determine the MWL as the mean value of the water surface variations measured at incremental time intervals over a certain time span. The maximum setup on the beach can reach values up to 30% of the incident significant wave height. The field investigations have shown that the rise of the mean water level due to wave setup is significant and should be taken in account in determining the design water level for coastal structures. (Sims-ISWS)
W78-08806

SOME CHARACTERISTICS OF UNSTABLE FLOW PAST SLOTS,
State Hydraulic Works, Ankara (Turkey). Research Center.
S. Ethembabaoglu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13738, p 649-666, May 1978. 16 fig, 18 ref, 1 append.

Descriptors: *Flow, *Fluid mechanics, *Hydrodynamics, Flumes, Laboratory tests, Dynamics, Cavitation, Turbulent flow, Turbulence, Gates, Hydraulic gates, Pressure, Vibrations, Hydraulics, Slots, Fluid dynamics.

Analysis of flow instability revealed that, as a result of fluid-dynamic feedback, flow fluctuations in the vicinity of slots (or cavities) may occur within narrow-band dominant frequencies and at large amplitudes. An experimental study was made to determine the possible flow patterns and the characteristics of the fluctuating pressures in the neighborhood of slots having five different slot-boundary configurations. The results confirmed the existence of well-defined, predominantly periodic pressure fluctuations. The relationships among the oscillation frequencies, flow velocities, the oscillation amplitudes, and the slot ratios were determined. The deviations from the analytical results at smaller slot ratios were considered to be due to the nature of the velocity profile of the approach flow and its development in the streamwise direction. (Sims-ISWS)
W78-08807

DISPERSION IN RIVERS AS RELATED TO STORAGE ZONES,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
G. V. Sabol, and C. F. Nordin, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13758, p 695-708, May 1978. 4 fig, 3 tab, 26 ref, 2 append.

Descriptors: *Dispersion, *Rivers, *Reservoirs, *Model studies, Mathematical models, Storage, Mixing, Suspended solids, Sediments, Flow, River flow, Sediment transport, Markov processes, Mathematics, Theoretical analysis, Sedimentation.

Longitudinal dispersion was considered as a simple stochastic process in which a particle travels random time periods at constant velocity, with travel periods separated by random time periods during which the particle is trapped in storage zones. The average number per unit time of entries into storage was considered to be a function of time. The resulting model was a nonhomogeneous

compound Poisson process defined by three parameters. Methods for estimating the parameters were given, and predicted concentration distributions were shown to agree reasonably well with observed field data. (Sims-ISWS)
W78-08808

SECONDARY FLOW IN NONCIRCULAR CONDUITS,
Research Council of Alberta, Edmonton. Transportation and Surface Water Engineering Div.
R. Gerard.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13764, p 755-773, May 1978. 5 fig, 25 ref, 2 append.

Descriptors: *Pipe flow, *Closed conduit flow, *Conduits, *Model studies, Mathematical models, Hydraulic conduits, Turbulence, Velocity, Flow, Reynolds number, Stress, Shear, Fluid mechanics, Hydraulics, Secondary flow.

A requirement for calculating an accurate velocity distribution in noncircular conduits is a knowledge of the secondary flow distribution in these conduits. The cause of these secondary flows was considered in this paper, and a simple momentum transfer model for Reynolds stresses was used to effect a solution for the secondary flow in a square duct. The calculated secondary flows were similar in magnitude and direction to measurements reported in the literature. (Sims-ISWS)
W78-08809

MODIFIED PROPORTIONAL V-NOTCH WEIRS,
Indian Inst. of Science, Bangalore (India). Dept. of Civil Engineering.
K. K. Murthy, and P. K. Gopalakrishna.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13781, p 775-791, May 1978. 9 fig, 5 tab, 12 ref, 2 append.

Descriptors: *Weirs, *Design, *Laboratory tests, Flumes, Discharge(Water), Measurement, Flow, Streamflow, Equations, Structures, Hydraulic structures, Theoretical analysis, Data processing, Water resources, Hydrometry, Hydrology, Hydraulics, V-notch weirs.

Seven different-shaped modified proportional V-notches were designed, and pertinent data for their use were given. It was shown that the indication accuracies of these weirs are more than that of the conventional V-notch. For five of the designed weirs, the indication accuracies were more than that of the conventional rectangular weir at lower heads of flow. All these proportional weirs, except the parabolic based weir, have added advantages over the V-notch in regard to fixing and finding the crest level. Experiments with five weirs (four symmetrical and one unsymmetrical) having rectangular bases and one (symmetrical) with a parabolic base showed very good agreement with the theory and gave consistent values for the coefficient of discharge, C sub d, varying between 0.588 and 0.605, within the ranges of the experiments. (Sims-ISWS)
W78-08810

REVIEW OF OSCILLATORY BOUNDARY LAYER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
D. W. Knight.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13796, p 839-855, June 1978. 9 fig, 1 tab, 64 ref.

Descriptors: *Boundary layers, *Reviews, *Flow, Estuaries, Hydraulics, Hydrodynamics, Oceanography, Unsteady flow, Velocity, Waves(Water), *Boundary shear, Oscillations, Velocity distribution.

Recent theoretical and experimental knowledge concerning oscillatory boundary layers was reviewed in this paper, and an assessment was made of the present state of understanding of this particular form of unsteady flow. Although agreement was found between theory and experiment for the case of laminar oscillatory flow over a smooth flat bed, theoretical knowledge concerning other types of oscillatory flow in both laminar and turbulent conditions was shown to be inadequate. Some attention was given to the problem of defining the transition between a truly laminar condition and a fully developed turbulent one for unsteady flow over beds of different roughness and form. Attention also was focused on the increase in boundary shear stress that arises from frequency effects. (Lee-ISWS)
W78-08811

NAVIGATION LOCK, THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON; HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div., North Pacific, Bonneville, OR. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 318, Price codes: A06 in paper copy, A01 in microfiche. Technical Report 56-1, May 1965. 99 p, 64 fig, 3 tab.

Descriptors: *Locks, *Oregon, *Washington, *Model studies, *Hydraulic models, *Columbia River, Dams, Navigation, Flow, Flow control, Gates, Structures, Concrete structures, Hydraulic structures, Engineering structures, Loads(Forces), Hydraulics.

Tests were conducted on a 1:25-scale model of the 86-ft-wide by 675-ft-long navigation lock chamber, hydraulic system, and approaches of The Dalles Dam on the Columbia River. Model tests on elements of the original design lock showed that improvements were needed. Vortex action extended through the intake and filling culverts and created an explosive discharge within the lock chamber. With an initial head of 90.5 ft, the lock filling time was 12.0 min, emptying time was 5.8 min, and maximum forces on barge tows moored within the lock chamber were 15.7 tons. The maximum forces, which occurred about 1 min after the filling valves began to open, indicated that the initial phase of valve motion was too rapid. Strong eddy action and maximum velocities greater than 10 fps showed that improved distribution of lock outflow into the downstream approach was required. (Sims-ISWS)
W78-08818

DEVELOPING ZONE CHARACTERISTICS IN AERATED FLOWS,
Indian Inst. of Tech. Madras. Dept. of Civil Engineering.
B. S. Thandaveswara, and N. S. Lakshmana Rao.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY3, Proceedings Paper 13605, p 385-396, March 1978. 12 fig, 1 tab, 15 ref, 2 append.

Descriptors: *Flow, *Aeration, *Air entrainment, Turbulence, Diffusion, Dispersion, Froude number, Model studies, Laboratory tests, Hydraulic models, Flumes, Channel flow, Correlation analysis, Hydraulics, Air concentration.

A knowledge of air concentration distribution is essential in the study of flow characteristics in the developing zone. The local mean air concentration along the flow was correlated with Froude number. The developing zone was classified into a dispersion zone and a diffusion zone based on the variation of wall concentration. (Sims-ISWS)
W78-09030

WAVE PROPAGATION IN STEEP ROUGH MOUNTAIN STREAMS,
Forests Commission of Victoria, Melbourne (Australia).
For primary bibliographic entry see Field 2E.
W78-09032

DILUTION IN A VERTICAL ROUND BUOYANT JET,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
N. E. Kotsovinos.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 104, No. HY5, Technical Note, p 795-798 , May 1978. 9 ref, 1 fig, 1 append.

Descriptors: *Jets, *Flow, *Buoyancy, Analytical techniques, Analysis, Mathematical models, Laboratory tests, Dimensional analysis, Froude number, Equations, Cooling water, Waste dilution, Dispersion, Flow characteristics, *Plumes, Bouyant jets, Dilution, Densimetric Froude number.

A round, vertical, turbulent buoyant jet was defined as a source of fluxes per unit mass of mass, momentum, and buoyancy, issued through an orifice of diameter D into a nonflowing fluid of uniform density. Such flows occur often in hydraulic engineering (waste disposal in ocean, cooling water from power plants, stacks, etc), and the time average mean concentration along the axis of the buoyant jet often needed. A semi-empirical formula for the center line dilution in a vertical round buoyant jet in a nonmoving environment was derived. A comparison with existing experimental results indicated that the formula can be applied for a wide range of the initial densimetric Froude number, i.e., from very large Froude numbers (jets) to small Froude numbers (plumes). (Humphreys-ISWS)
W78-09033

AMERICAN DEVELOPMENTS IN HYDRAULIC MEASUREMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
J. F. Ripken.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13821, p 857-868, June 1978. 1 ref, 1 append.

Descriptors: *Measurement, *Instrumentation, *Discharge(Water), *Flow measurement, *History, Equipment, Flow meters, Flow, River flow, Stream gages, Tracers, Weirs, Electronic equipment, Orifices, Orifice flow, Flumes, Channel flow, Rivers, Hydrometry, Hydraulics, Hydrology, Measurement history.

A historical summary is presented of American contributions to hydraulic measurement of streamflow for the period 1776-1976. The development and interrelation of conduit flow measuring devices, together with open channel measuring devices, was included in this update of previous historical summaries. The narrative style and historical sequencing is a useful complement to the more specific 'Bibliography on Discharge Measurement Techniques.' (Sims-ISWS)
W78-09036

DETERMINATE HYDRAULIC GEOMETRY OF RIVER CHANNELS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
R. D. Hey.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY6, Proceedings Paper 13830, p 869-885, June 1978. 2 fig, 56 ref, 2 append.

Descriptors: *Channel morphology, *Sediment transport, *Alluvial channels, *Erosion, *Bank stability, Hydraulics, Flow resistance, Meanders, Continuity equation, Channel flow, *Hydraulic geometry, Process equations, Bank competence.

Natural channels have the ability to adjust their flow and bankfull hydraulic geometry in response to flow conditions. Nine governing equations are necessary to define the complete adjustment process and to relate channel response to discharge, sediment load, bed, and bank sediment, and the valley slope. A preliminary analysis allowed the nature of this process-response model to be identified, although insufficient information is known about all the processes for it to be used for design purposes. The necessary dependent and independent variables for the development of empirical design equations are identified by the model, and it also confirms the determinate nature of alluvial channels. (Singh-ISWS)
W78-09037

HYDRODYNAMIC PERFORMANCE OF PIPE UNDERDRAINS,
Technion-Israel Inst. of Tech. Haifa (Israel). Dept. of Hydrodynamics and Hydraulic Engineering.
J. Mevorach, and K. Zanker.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13636, p 127-142, March 1978. 15 fig, 4 ref, 2 append.

Descriptors: *Valves, *Hydraulic valves, *Drainage, Channels, Flow, Drains, Pipes, Sediments, Groundwater, Floods, Mathematical models, Laboratory tests, Hydrodynamics, Drainage engineering, Hydraulics, Flap valves, Flexible-flap drain valves, Underdrains.

Theoretical analysis and laboratory investigations of flexible-flap drain valve in high-velocity open channel flow were presented. Main hydrodynamic characteristics of the valve are: (1) Radial diffuser action, which prevents the valve from opening at low pressures; and (2) uplift forces, caused by high-velocity flow in the channel, helping the valve to open. The most severe condition for the valve operation is when there is little or no flow in the channel, but there is still high groundwater table around the channel. Flap-valves are found suitable for use in high-velocity flows, provided that the ratio of radii, R sub 2/R sub 1, between the circular flap and the valve opening is kept as low as compatible with engineering considerations. (Sims-ISWS)
W78-09046

HYDRAULICS ELEMENTS OF A PARTIALLY SILTED ROUND SECTION,
Soil Conservation Service, Baton Rouge, LA.
W. Talbot, and H. J. Braud.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 2, p 288-292, March-April 1978. 10 fig, 4 ref.

Descriptors: *Hydraulic conduits, *Sediments, *Flow, *Mathematical models, Model studies, Flow, Drainage, Pipe flow, Silts, Water levels, Roughness(Hydraulic), Hydraulics.

An analysis was made of a round conduit section with sediment in the section. Culverts often are partially filled with sediment. Area, wetted perimeter, hydraulic radius, section factor, and weighted Manning roughness factors were given for the full range of sediment depth-to-diameter ratios and possible flow depths. (Sims-ISWS)
W78-09047

COASTAL BARRIER CHANGES, 1770-1867, BISCAYNE BAY AREA, FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2L.
W78-09053

CHANNEL ENTRANCE RESPONSE TO JETTY CONSTRUCTION,
Army Engineer District, Galveston, TX.
J. M. Kieslich, and C. Mason.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 740, Price codes: A02 in paper copy, A01 in microfiche. American Society of Civil Engineers, Proceedings of the Specialty Conference on 'Civil Engineering in the Oceans/III' held at the University of Delaware, Newark, Delaware, p 689-705, June 9-12, 1975. 10 fig, 11 ref.

Descriptors: *Jetties, *Channels, *Tides, *Tidal waters, *Inlets(Waterways), Thalweg, Bays, Sediment transport, Littoral drift, Waves(Water), *Channel entrance, *Tidal inlets, Inlet structures, Longshore.

This paper presented the results of an investigation where documentation indicated that there is a trend in response of the tidal inlets as a result of the construction of single jetties. The results of the study are expected to help in the design of inlets and inlet structures. Preliminary results of an inlet study were presented, including a summary of the history of several improved inlets and qualitative explanations for their observed behavior. (Bhoemik-ISWS)
W78-09058

SHOALING RATE PREDICTION USING A SEDIMENTATION TANK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-09059

COMPUTERIZED DESIGN AND ANALYSIS OF SPRINKLER IRRIGATION SYSTEMS,
Maine Univ. at Orono. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-09127

EFFECT OF DRAIN DIAMETER, OPENINGS AND ENVELOPS ON WATER TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, and Y. K. Tang.
Paper No. 77-2578 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, Chicago, Illinois, 21 p, 10 fig, 4 tab, 15 ref.

Descriptors: *Drainage, Drainage effects, *Drainage engineering, Drainage practices, Drainage systems, Soil water movement, *Water table.

Numerical solutions to the Richards equation for flow to parallel drains were used to determine the effects of drain tube diameter, openings and envelopes on water table drawdown. (Skogerboe-Colorado State)
W78-09132

LAKE ERIE AIRPORT STUDY,
Howard, Needles, Tammen and Bergendoff, Cleveland, OH. Cleveland Aviation Office.
For primary bibliographic entry see Field 6G.
W78-09186

RESTRAINTS ON WATER TRANSMISSION MAIN CONSTRUCTION,
Partner, Black and Veatch, Denver, CO.
D. R. Sayles.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 103, No. TE2, p 269-277, March 1977. 1 ref.

Descriptors: *Water distribution(Applied), *Regulation, *Pipelines, *Constraints, Construction, Planning, Design, Water resources, Water transport, Colorado, Economics, Physical restraints.

The restraints on water transmission main construction are physical, economical, and regulatory. These basic restraints may be characterized as inflexible, flexible within limits, or flexible without limits. This paper considers these various restraints and how engineers have coped with them in constructing water transmission mains, especially in the mountainous regions of Colorado. Regulatory restraints are the latest, and at times, the most difficult for the engineer. These restraints, unlike the physical and economical, do not adjust readily to changing conditions. The engineer must become actively and positively involved in the political scene to assure that regulatory restraints are beneficial to the community as a whole. Long-range planning and design for a water utility, as well as for other utilities, should consider all possible restraints for maximum good to the total living system. The expertise within ASCE and other professional organizations should be made available for passage of needed legislation. (Bell-Cornell)
W78-09187

PREDICTIONS OF HEAT AND MASS TRANSFER IN OPEN CHANNELS,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 5B.
W78-09203

A MODEL TO INVESTIGATE THE INFLUENCE OF SUSPENDED SEDIMENT ON THE MASS TRANSPORT OF A POLLUTANT IN OPEN CHANNEL FLOW,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-09219

FLOOD CONTROL CONDUITS FOR DETROIT DAM, NORTH SANTIAM RIVER, OREGON; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific Bonneville, OR. Div. of Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 315, Price codes: A04 in paper copy, A01 in microfiche. Report No. 45-1, June 1955. 59 p, 42 fig, 10 tab.

Descriptors: *Dams, *Oregon, *Hydraulic conduits, *Flood control, *Model studies, Hydraulic models, Open channels, Flow, Structures, Hydraulic structures, Laboratory tests, Measurement, Pressure, Piezometers, Photography, Hydraulics, *Detroit Dam(Ore), *North Santiam River(Ore).

The model investigation of the flood control conduits for Detroit Dam on the North Santiam River, Oregon, was undertaken to study the hydraulic performance of the conduits under the operating criteria established by the Portland District and to recommend improvements in the basic design. The model was constructed of plastic to a scale of 1:20. Tests of the original design for the conduit (Plan A), which was 5.67 ft wide and varied in height from 14 ft near the valves to 24 ft at the outlet, revealed that an increase in height throughout the entire length of the conduit was required to obtain the desired hydraulic performance of open channel flow in the conduits for all conditions of operation. The requirements of open channel flow with the air vents closed for al valve openings and all reservoir levels to maximum pool Elev 1574, feet mean sea level, was not attained. With air vents closed, flow from a fully opened valve filled the conduit when the forebay pool was at or above Elev 1465. Model investigations showed that a 7-

ft-wide conduit having a height of 16 ft near the valve and 36 ft at the outlet (Plan B-2) met the established criteria in all respects. (Sims-ISWS)
W78-09223

8C. Hydraulic Machinery

HYDRODYNAMIC PERFORMANCE OF PIPE UNDERDRAINS,
Technion-Israel Inst. of Tech. Haifa (Israel). Dept. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W78-09046

8D. Soil Mechanics

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 4 - QUATERNARY GEOLOGY AND AGE DATING,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09025

DEVELOPMENT OF METHODS FOR CALCULATION OF THE THERMAL REGIME OF ROCK-FILL DAMS IN REGIONS OF SEVERE CLIMATE,
Vsesoyuznyi Nauchno-Issledovatelskii. Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 8G.
W78-09218

8E. Rock Mechanics and Geology

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 1,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
L. R. Frei, J. D. Gilbert, and D. Ostenna.
August 1977, 44 p.

Descriptors: *Seismic evaluation, Geology, Age dating, Mineralization, Structural geology, Maidu East Shear Zone, Site investigations, Damsites, *Faults(Geologic), *Earthquake engineering, *Auburn Dam(Calif), Central Valley Project(Calif), California.

This volume, 1 and 3 comprising the report, contains the narrative of the report and 24 geologic drawings referenced in the text. Additional drawings and appendices are included in Volumes 2 and 3. The investigations were conducted in the immediate area of the damsite by the USBR Auburn project Geology staff with input from independent consultants. They are concerned principally with the structural and stratigraphic relationships of features in the site area and influence determination of the potential for surface faulting in the dam foundation. It was concluded that a Mesozoic, regional fault system is present both upstream and downstream of the damsite. A shear zone located within 1/2-mi. from the site is inactive by USBR criteria. A fault zone known as F-1, believed to be part of a local fault system, has moved last, relative to other major structures, in the damsite and the possibility of movement along structures termed T-zones is not credible. (See W78-09019 and W78-09020) (Bur Reclam)
W78-09018

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 2,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
L. R. Frei, J. D. Gilbert, D. Ostenna, and R. Throner.
June 1977, 52 p.

Descriptors: Geology, Age dating, Mineralization, Faulting, *Fault criteria, Arch dams, *Preconstruction investigation, *Earthquake evaluation, *Faults(Geologic), *Earthquake engineering, *Auburn Dam(Calif), Central Valley Project(Calif), California.

This volume contains four appendices to the narrative included in Volume 1 of the report, and 17 geologic drawings referred to in the text. Appendix 1 - Auburn Dam Foundation Investigation, Design and Construction by L. R. Frei, summarizes the preconstruction geologic investigation and design considerations at the damsite. Appendix 2 - Bureau of Reclamation, Fault Classification and Investigation Criteria for Auburn Damsite Evaluation presents the criteria by which fault activity assessments will be determined for the seismic evaluation at Auburn Damsite. Appendix 3 - Auburn Damsite - Certain Mineralogical and Structural Features, by R. Merriam, a private consultant for the Bureau of Reclamation, describes gouge and mineralization studies along the F-1 fault zone in the left abutment of the dam. Appendix 4 - is entitled 'Mineralization and Structural History of the F-1 Fault Zone - Auburn Damsite by P. Behrman and C. Meyer. This study is an investigation of the geology and structural history of the damsite to determine or bracket the age of faulting. (See also W78-09018) (Bur Reclam)
W78-09019

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 3,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
L. R. Frei, J. D. Gilbert, R. Throner, and D. Ostenna.
June 1977, 84 p.

Descriptors: Soils, Mehrten formation, *Seismic investigation, Paleosols, *Age dating, Sierran Foothills, Foothills Fault System, Soil tounges, Maidu East Shear Zone, *Earthquake evaluation, Earthquake engineering, Damsites, *Faults(Geologic), *Auburn Dam(Calif), Central Valley Project(Calif), California.

This volume contains two appendices to the narrative included in Volume 1 of the report, and 14 geologic drawings and logs. Both appendices are reports by Roy J. Shlemon, a private consultant hired by the Bureau of Reclamation, to perform geomorphic investigations to augment those of Woodward-Clyde Consultants. Appendix 5 - Soil-Geomorphic Investigations - Auburn Dam, California - Preliminary Phase, is a report of field reconnaissance to determine the possible presence and time of last movement of faults located at or near the proposed damsite. Estimated ages of paleosols, the characteristics and distribution of clay-filled fractures in the Mehrten formation, and colluviation of the Mehrten formation are presented, both generally and specifically as they related to shearing in the dam vicinity. Appendix 6 - Soil- Geomorphic Investigations, Maidu East Shear and F-O Fault Zones, Auburn Dam area, California, addresses the dating of two shear zones in the damsite area. Shelmon concludes that the Maidu East Shear Zone is inactive and the age of last movement on fault zone F-O is indeterminate. (See Also W78-09018) (Bur Reclam)
W78-09020

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA, VOLUME 1 - SUMMARY REPORT,
Woodward-Clyde Consultants, San Francisco, CA.
L. Cluff, D. Packer, and D. Moorhouse.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 95 p, 16 fig, 22 ref. USBR 6-07-/DS/72090.

Descriptors: *Seismic studies, Geology, Regional studies, Sierran Foothill(Geology), *Seismicity, California, *Earthquake engineering, *Engineering geology, Faults(Geologic), *Earthquake evaluation, *Auburn Dam(Calif), Central Valley Project(Calif).

Part I of a 8-volume report presents a summary and the conclusions of an independent earthquake evaluation study for the proposed Auburn Dam in California. Included are sections pertaining to the approach of earthquake evaluation studies, the methods of the study, the scope of the study, background information, a summary of conclusions, and summaries and conclusions of other supporting volumes. It was concluded that the MCE for Auburn Dam should be a 6 to 6 1/2 m earthquake; there is an indeterminate (active) fault approximately 1/2-mile from the damsite, and the most likely locations for surface faulting are along certain structures that exhibit 'bedrock characteristics.' (See also W78-09022 thru W78-09028) (Bur Reclam)
W78-09021

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 2 - SURFACE FAULTING POTENTIAL,
Woodward-Clyde Consultants, San Francisco, CA.
D. P. Schwartz, F. H. Swan, R. E. Harpster, T. H. Rogers, and D. E. Hitchcock.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 379 p, 55 fig, 3 tab, 43 ref, 3 append. USBR 6-07/DS/72090.

Descriptors: *Lineaments, *Surface faulting, *Site exploration, Structural geology, California, Seimic studies, *Faults(Geologic), *Earthquake evaluation, Earthquake engineering, Reservoir sites, Engineering geology, *Auburn Dam(Calif), Central Valley Project(Calif).

Volume 2 presents the results of the investigation for the potential for surface fault rupture at the site of the proposed Auburn Dam. The potential for surface faulting was evaluated by the 'active fault concept', it is considered active if it has experienced displacement within a specified interval of time. To identify the most probable locations of active faults, an analysis of lineaments was conducted from Oroville to near Sonora. At 11 exploration localities for the study, two faults were classified as active, five were classified as indeterminate inactive and one locality was not fault related. The pattern of late Cenozoic faulting, bedrock geology at the damsite, the assessment of fault activity in the dam foundation and the potential for surface fault rupture are also presented. (See also W78-09021) (Bur Reclam)
W78-09022

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 3 - REGIONAL GEOLOGY AND TECTONICS,
Woodward-Clyde Consultants, San Francisco, CA.
J. N. Alt, D. P. Schwartz, and D. R. McCrumb.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 212 p, 28 fig, 2 tab, 143 ref, 4 append. USBR 6-07/DS/72090.

Descriptors: *Seismic studies, *Regional study, *Late Cenozoic faulting, *Cenozoic stratigraphy, *Tectonics, *Earthquake evaluation, Earthquake engineering, California, *Faults(Geologic), *Auburn Dam(Caif), Central Valley Project(Calif).

Volume 3 presents the resuls of the regional evaluation of late Cenozoic faulting for the earthquake evaluation studies conducted for the Auburn Dam. The areas investigated are along the western Sierra Foothills west of Auburn from the North Fork of the Feather River to the Cosumnes

River, also an area near Chico, California to the northwest of Oroville, and two smaller study areas, one north and one southwest of the damsite. The investigation concludes that late Cenozic faulting in the area of investigation is more extensive than previously recognized, and that displacements are greatest in the northeastern portion of the study area. Pre-existing zones of structural weakness are preferential locations for late Cenozoic faulting. Most of this faulting is high angle, normal, down-to-the-east, some of which either have short recurrence intervals or are associated with large displacements. (See also W78-09021) (Bur Reclam)
W78-09023

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 5 - SEISMOLOGY,
Woodward-Clyde Consultants, San Francisco, CA.
B. Foxall, T. Turcotte, K. McNally, and E. VonDollen.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 51 p, 19 fig, 8 tab, 15 ref. USBR 6-07/DS/72090.

Descriptors: *Seismic studies, *Historical seismicity, *Microseismicity(Sierran Foothills), California, *Earthquake evaluation, *Seismology, *Earthquake engineering, *Auburn Dam(Calif), Central Valley Project(Calif).

The evaluation studies presented in this volume are the results of two tasks. The findings of the first task, a review of a few, specific, historical earthquakes to evaluate sources of maximum intensities, and the intensity of each in the vicinity of Auburn Dam, are described in a 'historical seismicity study'. A summary of earthquake data, intensity and isoseismal maps, methods of search and a summary of data for events are presented. The second study was an instrumentally recorded survey of the micro-earthquake activity in the Sierran Foothills region between Oroville and Auburn. Hypocentral locations and focal mechanism of the earthquakes were estimated. (See also W78-09021) (Bur Reclam)
W78-09024

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 4 - QUATERNARY GEOLOGY AND AGE DATING,
Woodward-Clyde Consultants, San Francisco, CA.
F. H. Swan, and K. Hanson.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 224 p, 15 fig, 4 tab, 71 ref, 6 append. USBR 6-07/DS/72090.

Descriptors: *Quarternary geology, *Age dating, Paleodsols, *Earthquake evaluation, *Seismic studies, Earthquake engineering, *Soils, *Stratigraphy, Erosion, Alluviation, California, *Auburn Dam(Calif), Central Valley Project(Calif).

Included are the ages and methods for determining the ages of deposits and soils, and a brief Quaternary geologic history of the area incorporated in the regional study, for the Auburn Dam. Regional geologic and soil stratigraphic evidence indicates that climatic fluctuations resulted in episodes or erosion, colluviation and alluviation which can be dated to establish relative, if not specific ages, for stratigraphic markers to date known faults as active or inactive. Dates of these markers are derived for their application to assessments for fault activity. (See also W78-09021) (Bur Reclam)
W78-09025

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 7 - MAXIMUM CREDIBLE EARTHQUAKES,
Woodward-Clyde Consultants, San Francisco, CA.
D. R. Packer, J. N. Alt, and A. Patwardhan.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 49 p, 8 fig, 3 tab, 69 ref. USBR 6-07/DS/72090.

Descriptors: *Maximum credible earthquake, *Seismicity, *Damsites, California, *Earthquake evaluation, *Earthquake engineering, *Faults(Geologic), *Seismic studies, *Auburn Dam(Calif), Central Valley Project(Calif).

Conclusions presented pertain to the maximum credible earthquake (MCE) for the Auburn Dam project. (1) The damsite is located in a crustal block which has had minor and localized late Cenozoic faulting. (2) Faults judged indeterminate (active) occur within 0.5 miles of the Auburn damsite. (3) Geologic studies have shown that episodic slips have occurred along faults during the last 100,000 years, the maximum observed cumulative net slip is 2.4 feet, and the maximum net slip per event is judged to be 0.8 feet. (4) The MCE based on this evidence is judged to be a magnitude 6 to 6 1/2 earthquake at a focal depth of 6 miles, located within 0.5 miles of the damsite. (See also W78-09021) (Bur Reclam)
W78-09027

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 8 - EARTHQUAKE GROUND MOTIONS,
Woodward-Clyde Consultants, San Francisco, CA.
I. M. Idriss, M. S. Power, K. Sadigh, and R. Kulkarni.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, July 1977. 123 p, 13 fig, 3 tab, 53 ref, 3 append. USBR 6-07/DS/72090.

Descriptors: *Earthquake ground motions, Response spectra(Earthquakes), Oroville earthquake, *Maximum credible earthquakes, *Earthquake evaluation, Earthquake engineering, Seismic studies, *Auburn Dam(Calif), Central Valley Project(Calif), California.

The purpose of the studies described is to characterize for design purposes, the ground motions at the Auburn Dam site during maximum credible earthquakes (MCE). The MCE's addressed in the study include one nearby and two distant events. The development and assessment of response spectra, acceleration time histories and results of these motions are discussed for incorporation into design criteria for the proposed dam. (See also W78-09021) (Bur Reclam)
W78-09028

8F. Concrete

QUALITY CONTROL OF THERMOPLASTIC WATERSHOP JOINTS,
VTN Cnsolidated Inc., Irvine, CA.
For primary bibliographic entry see Field 8G.
W78-09185

A PROPOSED TECHNIQUE FOR TESTING AND EVALUATION OF HARDENED IRRIGATION DITCH CONCRETE,
Darco Engineering International, El Centro, CA.
For primary bibliographic entry see Field 8G.
W78-09265

8G. Materials

MARINE INPUTS OF POLYCHLORINATED BIPHENYLS AND COPPER FROM VESSEL ANTIFOULING PAINTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-08889

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME I,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
For primary bibliographic entry see Field 8E.
W78-09018

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 2,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
For primary bibliographic entry see Field 8E.
W78-09019

PROJECT GEOLOGY REPORT - AUBURN DAM - SEISMIC EVALUATION OF AUBURN DAMSITE, VOLUME 3,
Bureau of Reclamation, Auburn, CA. Central Valley Project Construction Office.
For primary bibliographic entry see Field 8E.
W78-09020

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA, VOLUME 1 - SUMMARY REPORT,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09021

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 2 - SURFACE FAULTING POTENTIAL,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09022

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 3 - REGIONAL GEOLOGY AND TECTONICS,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09023

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 5 - SEISMOLOGY,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09024

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 7 - MAXIMUM CREDIBLE EARTHQUAKES,
Woodward-Clyde Consultants, San Francisco, CA.
For primary bibliographic entry see Field 8E.
W78-09027

EARTHQUAKE EVALUATION STUDIES OF THE AUBURN DAM AREA - VOLUME 8 - EARTHQUAKE GROUND MOTIONS,
Woodward-Clyde Consultants, San Francisco, CA.

For primary bibliographic entry see Field 8E.
W78-09028

QUALITY CONTROL OF THERMOPLASTIC WATERSHOP JOINTS,
VTN Cnsolidated Inc., Irvine, CA.
E. R. Fisk.
Journal of the Construction Division, Vol. 103, No. CO1, Proceedings of the American Society of Civil Engineers, p 39-55, March 1977. 25 fig.

Descriptors: *Water stops, *Specifications, *Inspection, *Field tests, *Plastics, *Quality control, *Construction proecdure, Reservoirs, Hydrostatic pressure, Hydraulic structures, Joints(Connect9ions), Concrete.

A method of selecting, specifying, and inspecting polyvinyl chloride waterstop joints in concrete hydraulic structures to assure quality control under a zero-defects welded-joint concept is presented. Emphasis is placed upon basing selection of waterstop section on construction as well as design criteria. A set of quality control criteria is specified, and a special 'pen-knife test' is described. Sample specification data are included as a means of providing the inspection on construction as well as design criteria. A set of quality control criteria is specified, and a special 'pen knife test' is described. Sample specification data are included as a means of providing the inspection with the proper tools for quality assurance. (Bell-Cornell).
W78-09185

DEVELOPMENT OF METHODS FOR CALCULATION OF THE THERMAL REGIME OF ROCK-FILL DAMS IN REGIONS OF SEVERE CLIMATE,
Vsesoyuznyi Nauchno-Issledovatelskii. Gidrotekhniki i Melioratsii, Moscow (USSR).
N. A. Mukhetdinov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 539, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 616, May 1977. 12 p, 4 ref. Translated from the abstract of a disseration, Leningrad, p 2-28, 1973.

Descriptors: *Rockfill dams, *Temperature, *Model studies, Mathematical models, Heat transfer, Moisture content, Dams, Earth dams, Rock fill, Air, Permafrost, Structures, Hydraulic structures, Civil engineering, Cold regions, Cold weather construction, *USSR, Thermal regime.

This work presented the theoretical and experimental investigations which revealed the processes of formation of the thermal regime of individual structural elements of a rockfill dam (downstream prism, foundations, and inclined impervious core). Only the abstract of a dissertation was contained in this translation. (Sims-ISWS)
W78-09218

A PROPOSED TECHNIQUE FOR TESTING AND EVALUATION OF HARDENED IRRIGATION DITCH CONCRETE,
Darco Engineering International, El Centro, CA.
J. D. Hess.
Paper No. 77-2015 presented at the 1977 Annual Meeting of the American Society of Agricultural Engineers, June 26-29, 1977, Raleigh, North Carolina, 10 p, 4 fig, 1 tab.

Descriptors: *Irrigation canals, Irrigation systems, *Concretes, Sampling, Canals, Canal linings, Testing procedures.

A new testing technique is presented for the strength evaluation of hardened irrigation ditch concrete. The test procedure eliminates the need for evaluating in-service strength characteristics based solely upon conventional 6 inch by 12 inch cylinder tests or tests on small cores or prisms. No L/D corrections are required. (Skogerboe-Colorado State)
W78-09265

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

EDUCATION IN HYDROLOGY AND WATER RESOURCES IN THE UNITED STATES--1965-1974--AN OVERVIEW WITH RECOMMENDATIONS.
National Committee for the Internationa Hydrological Decade, Washington, DC. Work Group on Education and Training.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 915, Price codes: A05 in paper copy, A01 in microfiche. Fina Report, 1976. 83 p, 21 ref, 2 append. NSF C-310.

Descriptors: *Education, *Hydrology, *United States, *International Hydrological Decade, Training, Colleges, Universities, Schools(Education), Water resources, Scientific personnel, Technology, Environmental engineering, Sanitary engineering, Engineering, Civil engineering.

The report discussed conditions of education in hydrology and water resources in the United States for the period 1965-1974 and suggested future directions for education in these fields at university, pre-university, and continuing education levels. It also suggested some specific activities to assist education abroad and recommended periodic educational and manpower assessments. The report also recommended an overview committee concerned with education in water-related fields, additional financial assistance for such education, a hydrology-centered office in the National Science Foundation and an independent water institute to act as a clearinghouse for hydrological and water resources education and information. (Sims-ISWS)
W78-09055

9D. Grants, Contracts, and Research Act Allotments

SOIL, WATER, AIR SCIENCES RESEARCH.
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 2G.
W78-09213

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

ICE ON RIVERS AND LAKES--A BIBLIOGRAPHIC ESSAY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2C.
W78-08837

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUMES 1 AND 2.
Alaska Dept. of Education, Juneau. Div. of State Libraries and Museums.
For primary bibliographic entry see Field 2L.
W78-08896

A SUMMARY OF KNOWLEDGE OF THE CENTRAL AND NORTHERN CALIFORNIA COASTAL ZONE AND OFFSHORE AREAS. VOLUME IV: MASTER BIBLIOGRAPHY.
Winzler and Kelly. Eureka, CA.
For primary bibliographic entry see Field 2L.
W78-08933

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-08952

COASTAL MARSH PRODUCTIVITY: A BIBLIOGRAPHY.
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 05C.
W78-09108

BIBLIOGRAPHY ON DISCHARGE MEASUREMENT TECHNIQUES.
American Society of Civil Engineer, New York. Hydraulics Div.
For primary bibliographic entry see Field 04A.
W78-09138

AGRONOMY ABSTRACTS, 1977 ANNUAL MEETINGS.
American Society of Agronomy, Madison, WI.
For primary bibliographic entry see Field 03F.
W78-09150

GROUND WATER POLLUTION. PART 2. POLLUTION FROM IRRIGATION AND FERTILIZATION,
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 05B.
W78-09151

10F. Preparation Of Reviews

TRANSFER OF SYSTEMS TECHNOLOGY TO URBAN WATER MANAGEMENT,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 06A.
W78-08952

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Substantiation of the Maximum Permissible Concentration of Abate in Bodies of Water (In Russian),
W78-09242 5G

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W78-08968 6E

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W78-08885 5D

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W78-08885 5D

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W78-08882 5A

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